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# MODEL **Airplane** NEWS

## FLY RC INDOORS!

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Top Flite  
**Spitfire Mk. IX**  
GOLD EDITION

Ace **Dual Vari-Charger**  
Spirit of Yesteryear **Dallaire Sportster**  
**Towplane Techniques**

Getting Started in  
**JETS**

Everything  
you'll need  
to know page 101

May 2000

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48120

AirAGE



## Join the jet set



**H**ave you ever noticed that when someone comes to the flying field with a jet model, all other activity stops? Pretty soon, there's a crowd around the model, and everyone waits for the show. There's no denying the fact that jet aircraft have a reputation for sophistication, speed and high technology. Jets are sleek, aerodynamic and—even when they're sitting on the runway—they just look *fast*. Many RC'ers haven't gotten involved in this facet of aeromodeling because they think that jets are too expensive, complicated and difficult to fly, but the past few years have benefited from amazing advances in powerplant reliability and model construction. Turbine-powered jets have recently seen a lot of press, such as Rich Uravitch's article in our January 2000 issue. Although turbines are scale in every way—sound, function and even their smell—they can exceed the budgets of many sport modelers. Another, less expensive, alternative is the ducted-fan unit. These tried-and-true powerplants have evolved to offer modelers superior performance and reliability. This month, columnist George Leu tells all you need to know to get involved in ducted-fan jet modeling. A former president of the Jet Pilots Organization, George explains how ducted-fan powerplants work, offers information on jet kits and prices and even provides a list of jet events you can attend to get a first-hand look at some models. If you've always wanted to belong to the "jet set," there's no better time to get started.

### INDOOR CHOPPER

If going fast isn't your cup of tea, how about hovering? Imagine this: you're sitting in your living room flying your model from its launch pad on top of the TV to and from the coffee table. Science fiction? Think again: indoor RC flying has reached new heights with the



Ikarus Piccolo helicopter, reviewed on page 52 by Dave Baron. Powered by two supplied motors and a 3-cell Tadiran 800mAh pack, Dave has flight times of more than 25 minutes on a single charge. Now when it's raining, you won't need to rely on your flight sim to get some stick time; just charge up the batteries and fly inside. Dave, an expert heli pilot, also notes that a properly set up and trimmed Piccolo could be used as a helicopter trainer.

### TAIL SLIDE

For our aerobatic audience, in recent issues, our IMAC Aerobatics contributor has demystified the rolling circle, explained how to do a snap roll and how to perfect your split-S. This month, Dan Wolanski tackles the tail slide—a maneuver that is seldom done correctly. Often misunderstood, the tail slide is easier to accomplish than you may have thought. Turn to page 42 for a pilot's view of two variations of the tail slide.

### AEROTOWING

Who says that powered aircraft and gliders can't share the same airspace? This month, Dave Garwood explains why the team approach may be the best way to get your sailplane airborne. In his "Introduction to Aerotowing" on page 36, Dave explains how a sailplane pilot and towplane pilot work together—the way pilots of full-size sailplanes and towplanes do—to reach new heights. This facet of our hobby has experienced tremendous growth of late, and Dave provides a list of events that you can attend this year.

Those of us in the Northeast and other snowbound parts of the country are beginning to feel the spring thaw, and we're trying to finish our latest projects and are eagerly awaiting flying weather. See you at the field!

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PRINTED IN THE USA

# MODEL Airplane NEWS

MAY 2000 • VOLUME 128, NUMBER 5

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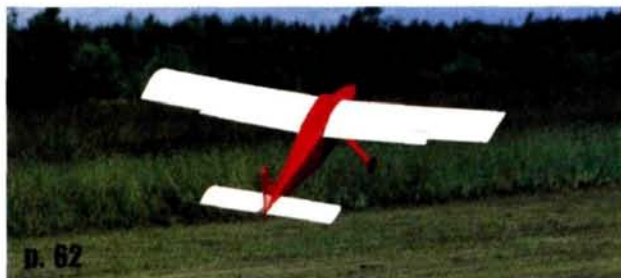
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ON THE COVER: main image—Top Flite's Mk. IX Spitfire Gold Edition performs a show pass. Jim Onorato takes an in-depth look at this beautiful warbird on page 46 (photo by Walter Sidas). Bottom—could a coffee-table helipad be in your future? Dave Baron stirs things up indoors this month with his review of the Piccolo electric helicopter. Top—Dan Wolanski covers the ins and outs of the tail slide in our continuing IMAC aerobatics series, "Flight Techniques."

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## THE KRC LEGACY LIVES ON

For nearly 20 years, the Keystone R/C Club of Hatfield, PA, held a yearly electric model fly-in known simply as "KRC." At first, as e-power was in its infancy, there were few participants, but as the years went on, the number of attendees increased to a point at which the event outgrew two model airfields. The last three meets attracted more than 250 pilots (some from overseas), who brought along hundreds of models, and more than 2,500 spectators—quite a feat for a small RC club!

In the spring of 1999, club members determined that they were no longer able to run and manage this continually growing exposition, and many modelers were disappointed. The wave of electric flight wasn't nearly ready to crest; owing in no small part to the KRC event, it is slowly becoming a tidal wave.

During the 1999 fun-fly season in the Northeast, many expressed a desire to see "KRC" revived in some form. E-power fly-ins that had traditionally been small attracted modelers who had previously attended KRC. These modelers wanted to see some of the best e-modelers fly their models, to talk with them and learn from them and visit vendors' exhibits. Clearly, the growing sport of electric model aviation could support a follow-on event.

Silent Electric Flyers of Long Island (SEFLI) has stepped up to the challenge and will host the next large-scale electric model fly-in in the Northeast. Called the Northeast Electric Aircraft Technology Fair (NEAT Fair), it will be held at the same time of year as the KRC meet (the third weekend in September) in Downsville, NY. The Peaceful Valley Campgrounds ([www.peaceful-valley.com](http://www.peaceful-valley.com)) site is a bit rustic, but the facility is huge and offers something for both overnight modelers and day-trippers. Downsville is about a 2½-hour drive northwest of New York City—still close enough to attract the large crowds that the KRC event did. Plans are just being formulated for 2000; however, I know NEAT Fair will offer modelers a chance to see some of the most impressive electric-powered models east of the Mississippi. Check out the NEAT website at [www.nyblimp.com/neat.htm](http://www.nyblimp.com/neat.htm) for updated information.

SEFLI members would like to thank the Keystone R/C club for all of its hard work over the last two decades. We sincerely hope that the new meet will continue the proud tradition that KRC started so many years ago.

HENRY PREW  
President, SEFLI



## USING A GYRO?

I saw an F4U Corsair that had a gyro in it. What reason is there to put a gyro in a plane? [email]

JAY KRUG

Jay, though originally designed for use with model helicopters, gyros (especially piezoelectric gyros) are being used more and more in fixed-wing aircraft. Rudder control is where most modelers use one. In jet aircraft, the gyro smoothes out the takeoff and landing rollouts. On tail-dragger aircraft such as the F4U Corsair, engine torque and P-factor can add to the challenge of making good takeoffs and landings, and the gyro calms things down. In hot-dog, freestyle aerobatics and 3D competitions, gyros can be used on all the control surfaces (including ailerons) to help with maneuvers such as torque rolls and hovers. As the cost of gyros steadily decreases, they become more attractive to fixed-wing RC modelers. Hope this helps.

GY

## Y-SHAPED PUSHRODS

Hi! I've been into RC for about eight years and have built several planes, including a Top Flite P-51, a Lanier ½-scale Extra 300S and a Goldberg Ultimate Bipe. I am now assembling the Hangar 9 Cap 232, but I am having a terrible time putting together the wooden dowel and threaded rods for the elevator. I just can't seem to get everything to fit. I read your "Field & Bench" review. Do you have any tips that might help me get it together correctly? I plan to power it with a YS 1.40 on a Hyde engine mount.

JOHN DODRILL,  
Beaumont, CA

John, it has been a while since I built and reviewed the H9 Cap 232, but here's what I did: I did not actually measure things when I installed the Y-shaped elevator pushrod. I usually install the elevator servo and mark its approximate location on the bottom of the fuselage. I then cut the two exit slots on the sides of the fuselage and install the elevator horns. Then, by laying out the dowel and pushrod wires, I make the pushrod of the approximate length needed. I add the clevises and align them with the elevator hinge line. Then I tape the dowel to the fuse bottom and measure from its end to the elevator servo. I attach the straight front pushrod wire and make it about an inch longer than needed.

When installing the pushrod, insert two lengths of outer Nyrod tube through the exit holes and into the radio compartment. Slip the "Y" ends of the pushrods into the Nyrod tubes and tape the rods and tubes together. Then, while pulling the tubes out, push the pushrod into the aft section of the fuselage. Its ends will come out of the exit slots. You may have to squeeze the pushrod wires together slightly as they pass through the built-up former in the aft fuselage, but the Nyrod trick usually works pretty well. Give it a try.

GY

## YOU WANT SERIOUS?

Chris Chianelli's review of the Hangar 9 PT-19 was very good. However, I can't believe that he installed those two Hobby Lobby "Mary" pilot figures in such a fine model aircraft.

Chris, this is a serious model aircraft and, in my opinion, deserves no less than Hangar 9 or DGA pilot figures—especially when you praised this model as you did. I wonder what Nick Ziroli must have thought when he saw this? Thanks for listening!!! [email]

BOBBY PATTERSON

Here's the story as I see it, Bobby: if women were good enough to check out newly manufactured



fighters and to deliver them around the United States during WW II, then they're certainly good enough to be depicted in my model PT-19. Moreover, some of those women pilots—known as WASPs (Women Air Service Pilots)—paid the ultimate price while fulfilling this vitally needed wartime service. I think that's just about as serious as things can get. Don't you?

As far as my long-time friend Nick Ziroli is concerned, he loves my pilots—that is, after he made sure they're wearing the correct flight suits. Though Nick may be the best-known scale designer in America, he hasn't forgotten how to have fun; for me, that's the most important part of our great hobby.

Anyway, I'm glad you liked the PT-19 article; it's a nice model, for sure. And remember, if women want to fly, you can't stop them! CC

**New products and people behind the scenes;** my sources have been put on alert to get the scoop! In this column, you'll find new things that will at times cause consternation, and telepathic insults will probably be launched in my general direction! But who cares? It's you, the reader, who matters most! I spy for those who fly!

**AIR SCOOP**  
BY CHRIS CHIANELLI



## Xtra Easy

A prebuilt, covered (in this case, with Ultracote), ready-to-fly trainer with radio and engine installed isn't anything new. On the other hand, one that comes with a computer radio is. Like others on the market, the Xtra Easy can be ready for the flightline in less than an hour, but this one is on the large side. I like that, too. With a 69-inch wingspan,



this model should be easy to see in flight and should have outstanding slower flight characteristics. Power is supplied by a twin ball-bearing MDS 40FS Pro that features a two-needle carburetor and MDS's all-new, MK II muffler.

Here's the best part. The model comes with JR's new, XF421EX digital computer system that includes Sanyo Ni-Cds and ball-bearing servos. And when your training days are over, the fun begins because the 421 has an extra channel so you can

expand the "fun-factor" by purchasing one—or all—of the optional accessories; things like a sailplane launch, an aerial photo box, or a drop chute. Those are sold separately.

I don't usually list prices in "Scoop," but in this case, I believe it's newsworthy. You can walk away with this fine-quality equipment—stuff you'll use for a long time—for about \$380. I think that's a pretty good deal.

Horizon Hobby Inc., 4105 Fieldstone Rd., Champaign, IL 61822; (217) 355-9511.



## Lite Stik

### BALL-FIELD BARON

Here's a quick look at Global's new Lite Stik park flyer from WattAge. The Lite Stik has a few interesting features, such as one-piece, close-cell foam wing halves and stab, and a dual-ball-bearing-supported gearbox/prop unit that slips onto the stick fuselage—much like a rubber-band driven motor fits on those stick gliders that we kids, young and old alike, have always loved. To tailor Lite Stik's performance for higher or lower top-end speed, different gear ratios and props (available as WattAge aftermarket parts) are offered. Specs are: flying weight—7 ounces; length—26 inches; wingspan—38 inches; area—238 square inches.

Global Hobby Distributors, 18480 Bandilier Cir., Fountain Valley, CA 92728-8610; (714) 963-0133; fax (714) 962-6452.

Great Planes now offers a 1/4-scale Giles G-202 ARF that comes covered with Top Flite MonoKote just as you see it here.

## BIG GILES ARF



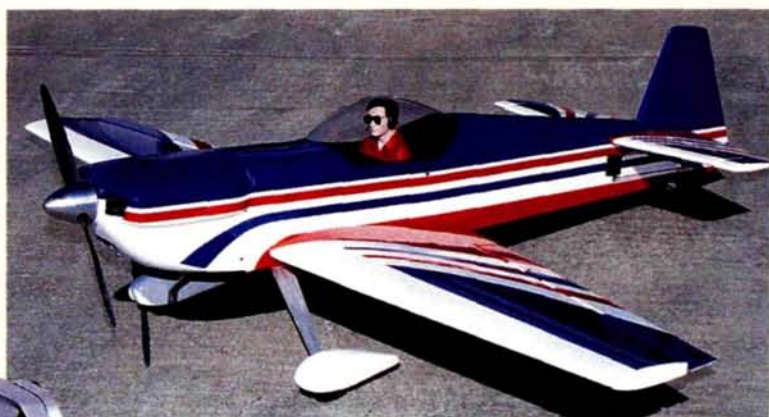
According to Great Planes, anyone who has built a .40-size sport ARF can build this big-scale, aerobatic model. The airframe is constructed entirely of balsa and ply interlocking parts, and the kit includes painted fiberglass cowl and wheel pants, Great Planes' hardware package, a canopy and heavy-duty aluminum landing gear. Specs are: wingspan—73 inches; area—973 square inches; weight—12.5 pounds; loading—29.6 ounces per square foot; engine requirements—1.20- to 2ci 2-stroke or 4-stroke.

Great Planes Model Distributors, 2904 Research Rd., Champaign, IL 61826-9021; (217) 398-6300; fax (217) 398-0008.

# 91 NEW & IMPROVED Surpass II

I can't tell you a whole lot about this new 91 Surpass II, which replaces the original FS-91, other than that it has a new carburetor that supposedly is extremely easy to adjust—not that the old one ever gave me any problems—and that it has a quieter muffler that delivers lower sound output without cutting power. Oh, yes, there is one more thing: critical internal engine parts have been specially plated so they're more rust-resistant. As you may know, 4-strokes are much more prone to lower-end component corrosion than are 2-strokes. Practical operational range is 2000 to 12,000rpm, power output is rated at 1.6bhp @ 11,000rpm, and weight is 23 ounces.

Great Planes Model Distributors, 2904 Research Rd., Champaign, IL 61826-9021; (217) 398-6300; fax (217) 398-0008.



## LANIER ENTERS ARF ARENA

**K**nown for reasonably priced, all-wooden kits, Lanier now offer this beautiful, 80-inch-wingspan CAP 232 ARF that heralds the company's entry into the almost-ready-to-fly market. Actually, now that I think about it, this is really Lanier's reentry into the ARF market. In the late '60s, Lanier pioneered ARFs with wooden, reinforced ABS fuselages and vinyl-covered foam wings. This new ARF, however, has nothing in common with those original designs. The 232 appears to possess state-of-the-art ARF technology in every way and, according to Lanier, it's built by master craftsmen using interlocking, laser-cut parts and computer-guided, foam-cutting equipment. The kit features plug-in, balsa-sheeted, foam-core wings, airfoil-shaped tail surfaces and painted fiberglass cowl and wheel pants. The model is covered in three colors of Ultracote and comes with American-made hardware. Specs are: wingspan—80 inches; area—1,265 square inches; weight—12 to 17 pounds; engine requirements—1.50- to 3.2ci 2-stroke or 1.60- to 3ci 4-stroke.

Lanier RC, P.O. Box 458, Oakwood, GA 30566; (770) 532-6401; fax (770) 532-2163.

## "JUGment" Day is Here

There's a story about an Fw 190 pilot who was trying to shoot down an already injured P-47 Thunderbolt headed back to England. The "Jug" had a foot or two of one wingtip missing, and the pilot could do little more than maintain level flight. The Fw 190 pilot tried in vain to shoot down the Jug from behind. Finally—amazed and out of ammunition—the German pulled alongside the Jug, saluted his American adversary and headed back to Deutschland. The "Jug" could

not only take a punch, it could deliver a knockout as well. Anything that got caught in the path of the lead "hailstorm" its eight 50-caliber guns threw out was quickly transformed to confetti. The P-47 Thunderbolt was a truly daunting opponent; I've always thought of it as a flying pit bull. Jugs were tough, and Republic built them right. And now, finally, there's a large-scale Gold Edition of this venerable fighter from Top

## BIG THUNDER HAS ARRIVED



Flite. Like other Gold Edition kits, the new Jug features CAD-engineered, interlocking parts and a fully sheeted exterior. The kit comes with a bubble canopy, but the wood parts and instructions are included for the "Razorback" version. The greenhouse canopy, however, is sold separately. The .60-size version of the Gold Edition P-47 has an excellent reputation for slow-flight characteristics, so I can only imagine what a great flyer this bigger version is going to be. Specs are: wingspan—85 inches; area—1,327 square inches; weight—20 to 22 pounds; loading—34.7 to 38.2 ounces per square foot; engine requirements—2.1- to 2.8ci (34.9 to 69cc) glow, or 2.5- to 4.2ci (41 to 70cc) ignition.

Great Planes Model Distributors, 2904 Research Rd., Champaign, IL 61826-9021; (217) 398-6300; fax (217) 398-0008.

## JR Flex Equip

### HAVE IT YOUR WAY

With model airplane sizes changing drastically—both up and down—at a very fast pace, Horizon has decided to introduce the FlexEquip program with its JR aircraft radio line. It's really simple; it works like this. Walk into your local hobby shop, tell the salesperson which radio you want and what battery size, receiver and servos (whether micro or maxi) you'd like the radio served up with, and wait as he logs onto Horizon's



**RADIO CUSTOMIZING**

website. In minutes, you'll have a quote for a FlexEquip system that exactly matches your needs, whether it's for a 28-inch wingspan, full-house micro flyer or a 140-inch-wingspan Ziroli C-47. And if you think this is going to make things a lot more expensive, forget it. Here's the deal. You pay the difference in street price, not retail, plus \$3 per item swapped. It's that simple. There is one rule: if a radio comes with a certain number of servos, you can add more, but you can't request fewer servos than the radio is originally offered with (this is available with all JR aircraft radios).

I think it's a fantastic idea that serves the needs of the modern RC modeler. I know I have a box full of "standard" servos (you know, the ones you're forced to take with a new radio purchase) that I'll never use—unless, of course, I decide to build a Dornier DoX that calls for 12 throttle servos! Contact your local hobby dealer or visit Horizon's website: horizonhobby.com



## Electric Jet F-16

**K**nown for its creativity in the micro-jet market, Electric Jet now introduces this Mini pusher-prop F-16. This design was such a hit at the '98 KRC electric event that the company decided to offer the little Fighting Falcon in ARF form. Specs are: wingspan—19.7 inches; length—28.3 inches; fly-



ing weight—12 to 14 ounces. A Speed 400 6V motor and Gunther prop are included. Also shown is Electric Jets' Micro EDF 200 fan unit that includes the motor for only \$21.95. Specs for this unit are: diameter—1.75 inches; weight—1.2 ounces

with motor; static thrust—4 ounces on 6 cells.

Electric Jet Factory, 8929 N. Ferber Ct., Tucson, AZ 85742; (520) 579-5609; fax (520) 579-5610.

## ARF Dago Red with retracts!

Many of you will recognize the famous Reno racer Dago Red. You may not be as familiar with the name AirBorne Models, but you soon will be; AirBorne makes an extensive line of high-quality ARFs, and Dago Red is the latest. The kit features a fiberglass fuselage, an all-wooden, built-up wing, installed and glued hinges, a fiberglass cowl with a 3D, transparent "working" cowl (to aid in setting up accurate engine cut-out



placement) and a hand-painted fuselage. Oh, yes; I almost forgot—Dago Red comes with pre-installed retracts!—an AirBorne innovation. The kit comes with a plastic spinner, but for an extra \$15, you can get the optional aluminum spinner. Considering that the model is priced at \$199.99 with the installed retracts, it looks like a good deal. One of our star writers, Jim Onorato, has been working on AirBorne's Midget Mustang, and he tells us, "The kit is very good quality; parts fit is excellent." I assume the same will be true of Dago Red. Specs are: wingspan—57.5 inches; area—585 square inches; engine required—.40- to .46ci 2-stroke, or .60- to .70ci 4-stroke.

AirBorne Models LLC, 2127-H S. Vasco Rd., Livermore, CA 94550; (925) 371-0922; fax (925) 371-0923. †

# PILOT PROJECTS

*A look at what our readers are doing*



## SUPER CESSNA

This Top Flite Cessna 182 is the handiwork of Lisbon, Portugal, modeler Francisco Leitão. The Skylane is equipped with an O.S. 1.20 III engine and rides on Robart landing gear. Francisco took this picture at a military base in Sintra, Portugal.



## KNOWS NOSES

Charlee Smith of Bob Smith Industries, Atascadero, CA, built this immaculately detailed PBJ-1J from a modified Wing Mfg. kit. Charlee has two interchangeable noses for it, so he can fly the plane with the all-glass green-

house or go in with the eight 75mm cannons blazing! The twin Laser .80-powered warbird is equipped with Robart retracts and a JR radio, and its Chevron color scheme is based on a plane Charlee saw in a 1950's-vintage *Model Airplane News*. The exhaust and gun residue are an excellent first attempt at airbrushing details.



## BORN TO BE WILD

Tom Perkins of Mt. Laurel, NJ, sent this photo of his 75-inch-span F4F Wildcat, which was built by Bob Karlsson. Bob built the plane—and the retracts—and is the original designer of the *Model Airplane News* plans. The 2½-year-project plane has eight servos controlled by a JR radio. The warbird has a Saito 1.50 4-stroke under the cowl swinging a 3-blade 16x8 propeller. Its maiden flight was about a year ago, and Tom reports that this rare model flies very well.

## Southern SE-5A

Here's a 1/4-scale SE-5A submitted by WW I enthusiast Alan Yendle. The Atlanta, GA, modeler built the 80-inch-span plane from the British D&B kit. Alan covered the 22-pound-plane with Solartex and added a Lewis gun that he can slide down on its mount for "reloading." Power for the beautiful biplane comes from a Cheetah 42cc engine.



**SEND IN YOUR SNAPSHOTS.** *Model Airplane News* is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Both color slides and color prints are acceptable. We receive so many photographs that we are unable to return them.

All photos used in this section will be eligible for a grand prize of \$500, to be awarded at the end of the year. The winner will be chosen from all entries published, so get a photo or two, plus a brief description, and send them in!

Send those pictures to: Pilot Projects, *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA.



## AEROBATIC ADOPTION

Chris Archie of Beaumont, TX, was in the right place at the right time. While Chris was flying one Sunday, a modeler who had partially completed this Goldberg Super Chipmunk came up to the field and offered the plane to a good home. Chris gladly accepted the model and finished the aerobat with metallic red and blue MonoKote with matching LustreKote paint. The Futaba 8UAFS-controlled plane is powered by an O.S. FS-91 Surpass.



## WHO YOU CALLIN' YELLOW?

Carman Spadafora Sr. of Meshoppen, PA, wants to know who said that Cubs have to be yellow. His Great Planes J-3 is his own personal protest project—covered in red by Howard Pascoe. You can see Carman picketing with the YS .53-powered plane at the Endless Mountains RC Club in South Montrose, PA.



## HOG WILD

If your hometown is Battle Creek, MI, you'd expect the skies to be full of warbirds; John Georgoff is certainly doing his share. A 4-foot Warthog that John designed for K&B .21 engines was featured in the May '94 issue of *Model Airplane News*. John has increased the foam, balsa and ply A-10 to a 78-inch-span but uses the same powerplants. He reports that the model performs figure-8s with ease, floats in for landings and is light enough to thermal!

## HOOSIER HOBBYIST

Ryan Plummer, a 15-year-old modeler from New Palestine, IN, has amassed quite a collection of models in only four years of modeling. His latest is this O.S. .91-powered Midwest Little Cap. He spent 9 months building the 8½-pound

model that features a hand-painted pilot complete with Ryan's club logo on its jacket. Some of Ryan's other hangar mates are a Morris Su-do-khoi and a Lite Machines helicopter.

## REFURBISHED IN RETIREMENT

The Live Wire Cruiser is a blast from the past courtesy of Marion Kitchens of Oakton, VA. The vintage model was originally constructed back in the early '60s, but recently, following Marion's retirement, he "re-energized" the classic with new radio equipment and tricycle landing gear. Marion says that the plane flies as it always did, "but the pilot is a lot older and slower" than he used to be!

## CAMO CROSS BOW

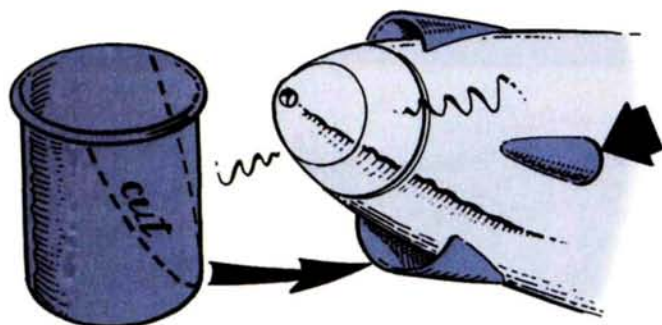
When Matt Ford of Glenwood Landing, NY, saw the Leading Edge Model Cross Bow, he knew it was a plane for him! Matt figured that a military color scheme would be a real hit, and he couldn't have been more right! He dressed up his model using a pilot and missiles from other kits he had lying around. The unique shape and camouflage trim are a real hit during slow flybys at his club field. According to Matt, the O.S. .46FX-powered plane is "really stable in the air."



# HINTS & KINKS

BY JIM NEWMAN

**SEND IN YOUR IDEAS.** Model Airplane News will give a free one-year subscription (or one-year renewal, if you already subscribe) for each idea used in "Hints & Kinks." Send a rough sketch to Jim Newman c/o Model Airplane News, 100 East Ridge, Ridgefield, CT 06877-4606 USA. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we can't acknowledge each one, nor can we return unused material.



## THE INS AND OUTS

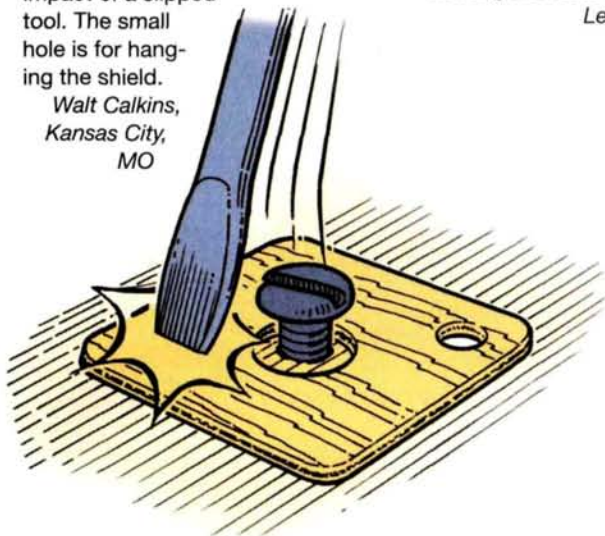
Cut empty pill containers or blister packs to make air intakes, outlets or small fairings to cover servos and pushrods. Fasten them in place with glue, double-sided tape, or adhesive trim.

*Daniel Picciuto, San Carlos, AZ*

## DING AND DENT SHIELD

If your screwdriver slips as you tighten the wing hold-down screws, you could damage your wing. To prevent this, cut this shield out of plywood or thick plastic; drill a large hole to clear the screw head, then place it as shown to absorb the impact of a slipped tool. The small hole is for hanging the shield.

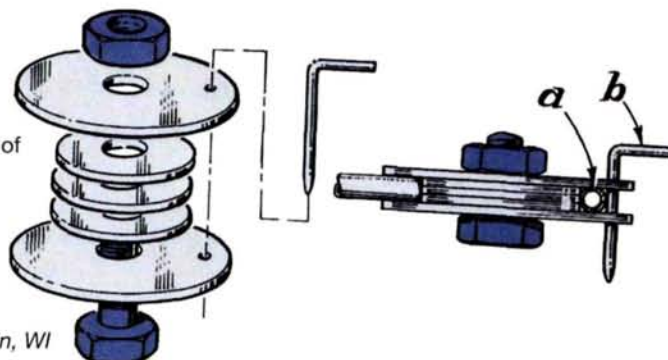
*Walt Calkins,  
Kansas City,  
MO*



## AROUND THE BEND

Large and small washers stacked and bolted as shown make a very simple but effective soft-metal tube bender. Drill holes through the edges of the large washers for a wire retaining pin. To use the bender: insert the tube (a), position the pin (b) to trap the tube, then pull the tube around the washers. Free your hands by holding the head of the bolt in a vise.

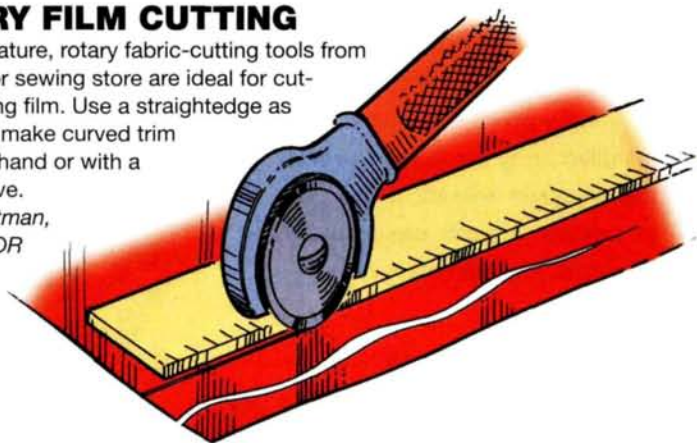
*Lee Richter, New Berlin, WI*



## ROTARY FILM CUTTING

Those miniature, rotary fabric-cutting tools from the fabric or sewing store are ideal for cutting covering film. Use a straightedge as a guide, or make curved trim pieces freehand or with a French curve.

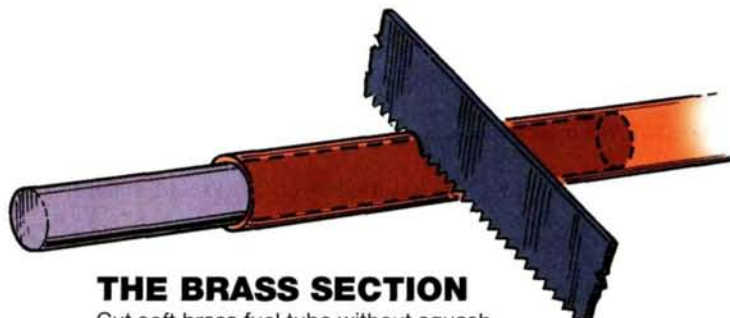
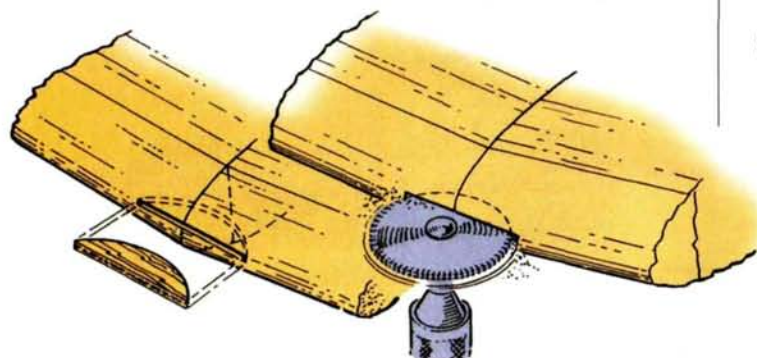
*Bob Hortman,  
Portland, OR*



## HAVE A BISCUIT

Strengthen your wing's center joint by cutting a half-round slit with a Dremel saw into the leading edge and then gluing in half-round biscuits cut out of 1/32-inch (0.8mm) birch plywood.

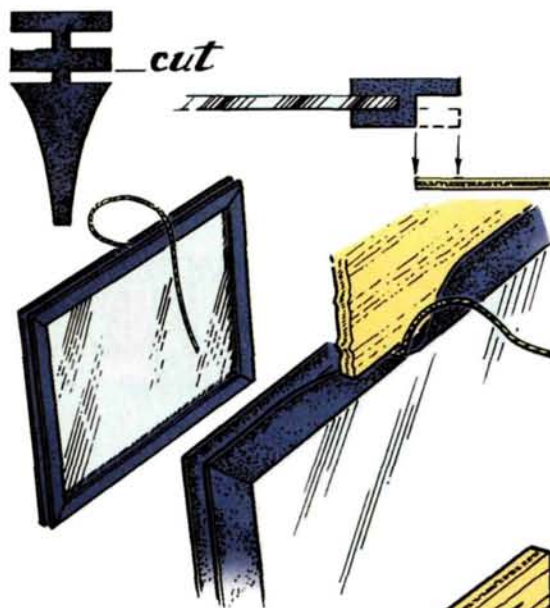
*Jack Arnould, Greenfield, MA*



## THE BRASS SECTION

Cut soft brass fuel tube without squashing it by placing closely fitting wire inside the tube, then cutting down to the wire all around the brass using a fine hacksaw. Clean up the rough edge with a fine file, and remove any inside burrs with a pointed blade.

*Jack Hilbert, Schnecksville, PA*



## A GLAZED LOOK

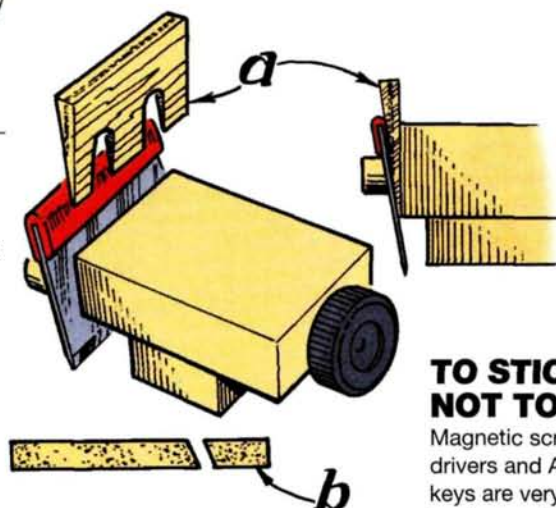
Use discarded windshield wiper blades, cut as shown, as beading to mount plastic window glazing. Trim off one leg of the "H," then glue the head to the inside of the fuselage frame. You could leave the "H" as is and use thin cord to pull the bead into position.

*Jim McCurrach, Vancouver, British Columbia, Canada*

## TAPERED PLANKS

Place a small plywood wedge (a) behind the blade of your balsa stripper. This tilts the blade to produce a tapered cross-section (b) for fuselage planking or floats.

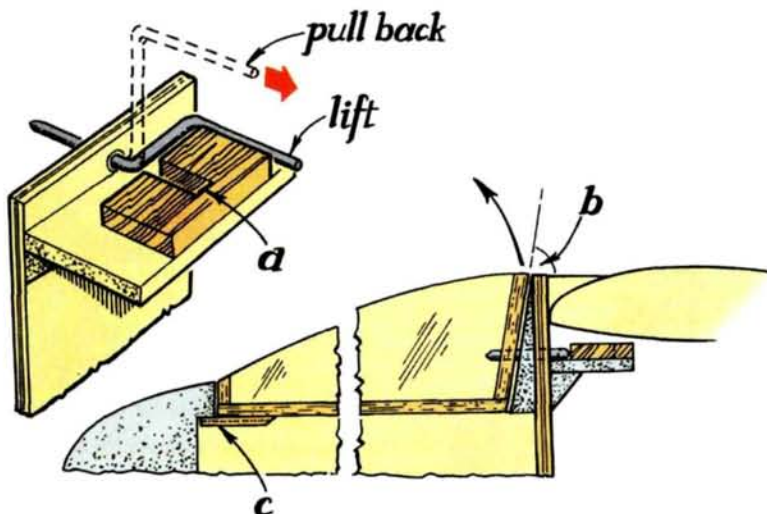
*Phil Mead, Georgetown, Ontario, Canada*



## HATCH LATCH

This canopy latch is prevented from rotating to the unlocked position by the wing. To open: remove the wing, lift the latch then pull it back into the slot (a) in the hardwood block. The angle (b) at the rear allows the canopy to rotate up and forward to disengage the tongue (c).

*Henry Simon, Bobcaygeon, Ontario, Canada*



## GLOW IGNITER FIELD CHARGER

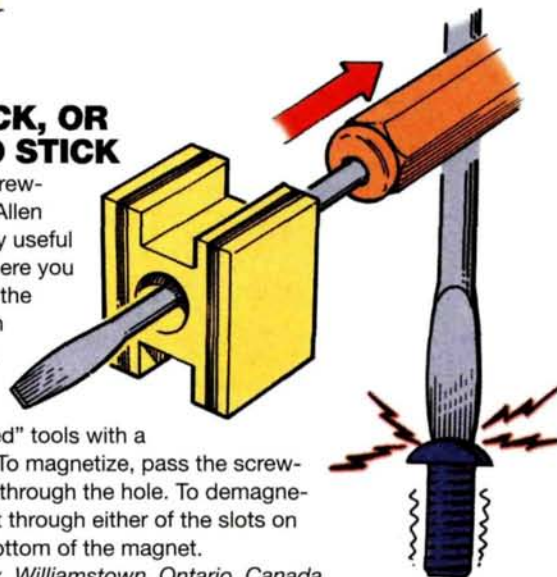
Make this charger by cutting the threads off a discarded glow plug. Drill the center post and soldering leads onto the post and side. Be sure the positive (red) lead goes to the center post. Apply shrink-wrap to the plug body as shown, then add banana plugs to the lead ends so that you can plug into the glow-plug sockets of your field box power panel. Charge the Ni-Cd cell at 1.5 amps for 20 minutes.

*Chris Duncan, Lawrencetown, Nova Scotia, Canada*

## TO STICK, OR NOT TO STICK

Magnetic screwdrivers and Allen keys are very useful in places where you cannot hold the fastener with your fingers. You can create your own "charged" tools with a magnetizer. To magnetize, pass the screwdriver blade through the hole. To demagnetize, stroke it through either of the slots on the top or bottom of the magnet.

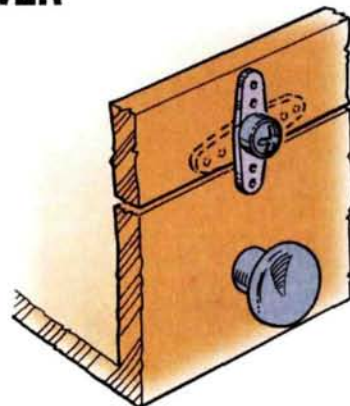
*Ken Cox, Williamstown, Ontario, Canada*



## ROTARY DRAWER LATCH

A worn-out servo arm makes a handy drawer latch on your field box. Put the spline side outward, and secure it with a washer and a wood screw.

*Richard Bayliss, Westmount, Quebec, Canada*



I first saw a jet model fly in 1974; the model was a Sundowner, and it was designed and flown by Bob Violet. I was so intrigued that I remained interested in jet modeling and successfully flew my first ducted-fan jet in 1979. The model was an F-100, and I powered it with a K&B 7.5cc engine turning a Turbax I fan unit—a very popular setup in the early days.

Today's ducted fans offer very good reliability and provide enough thrust to power just about any jet design you might care to fly. Though not yet commonplace, ducted-fan models have a lot to offer those who wish to get involved with them.

Many modelers don't try ducted-fan jets because they think the models are too expensive, too complicated and too difficult to fly. I can tell you that this just isn't so. If you really want to fly a jet, and you have good building and flying skills, there is a kit out there to meet most—if not all—of your expectations. Let's take a closer look.

by George Leu

# GETTING STARTED



## GETTING STARTED

Before you build and fly a ducted-fan jet, you should first evaluate your own building and flying abilities. Ducted-fan jets have never been considered beginner models so, at the very least, you should know how to fly a conventional sport aircraft. If you can easily fly a good .40 to .60 sport-pattern machine, you'll be able to handle a ducted-fan aircraft. Several

prop-driven models are available that will help develop your flying skills and expose you to higher airspeeds. The Great Planes® Patriot or other prop-driven, jet-like models are very good places to start. I do recommend, however, that you also gain experience in building and flying a foam and fiberglass (foam wing and fiberglass fuselage) pattern aircraft equipped with a tuned pipe and retractable landing

gear; this will expose you to the various building materials and construction techniques generally associated with jet construction. Believe me; if you take the time to get off on the right foot, you won't have any problems with jet aircraft.

No matter what you've heard or seen before, the best combination of engine, fan unit and kit should be a personal decision based on your own requirements. You should evaluate your desires for a particular model design

**Far left from top to bottom:**

**This Yellow Aircraft A-4 Skyhawk (built by Bob Boswell) is available with a 40-inch-span sport-wing for better slow-speed performance.**

**Jet Hangar Hobbies F-86 Sabre Jet in Air National Guard markings.**

**Lewis Patton flies this beautiful twin-engine F-4 Phantom from Yellow Aircraft. Not a beginners' model but definitely something to shoot for.**

**This Aermacchi MB 339 is an unusual and attractive model from DL Aeromodels. The model is powered by a RamTec fan and an O.S. .91 engine.**

# IN DUCTED-FAN JETS



## Stepping into the fast lane is easier than you think

Background: here's my BVM F-86 Sabre Jet—smooth and stable.

Left: a very popular entry among ducted-fan jets is the Maverick from BVM; excellent quality and flight characteristics.

Right: the Starfire IIC is a carbon-fiber-composite version of the popular sport model and is available from Jet Model Products.

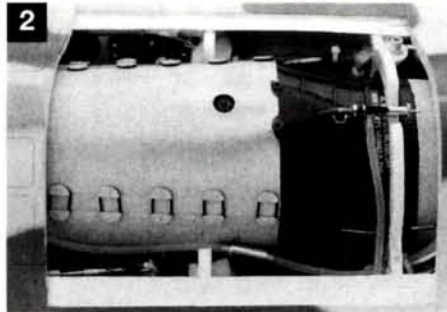
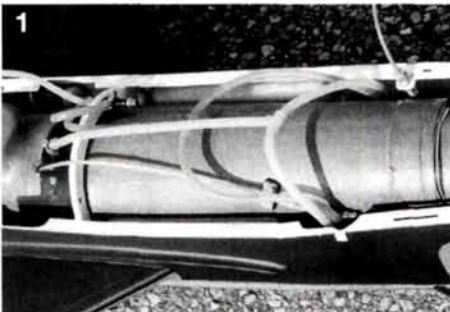


Below right: the new Balsa Bandit from BVM uses a built-up wing with the standard fiberglass fuselage and costs less than the foam and fiberglass version of the

Bandit. The wing is also slightly bigger on the Balsa Bandit, and this results in a lighter wing loading.



## GETTING STARTED IN DUCTED-FAN JETS



and then consider how much time and money you'll be able to spend to complete the model. Also think about your flying style; do you like scale or sport models? What is your building-skills level? Last, how competent a pilot are you? Don't be swayed by someone else's opinions; evaluate your own set of circumstances, and choose the model that fits your skills level and budget.

I also encourage you to attend a jet rally and see the various jet model products for

yourself. Talk to the pilots about their models, radios, engines, fan units and so on. Get literature from the various vendors at the events and speak to them about their products. You can really learn a lot by attending "jet-ins." Ask questions and learn from other people's experiences.

### FAN UNITS

It isn't easy to make generalizations about ducted-fan units. No currently manufactured fan unit is all things to all people;

each has its strong points. The popular trend today is toward building and flying jet models that have wingspans of about 80 inches and that weigh between 16 and 20 pounds. Fan units such as the Byron Originals\* Byrojet, Jet Model Products\* Dynamax and the Bob Violett Models\* Violett and Viofan are specifically designed to power these larger aircraft that typically use .65 to .96ci engines.

Fan units such as the Jet Hangar Hobbies\* Turbax or the Kress Jets\* RK-740

## QUESTIONS AND ANSWERS FOR FIRST-TIME JET MODELERS

**Q:** Are jets difficult to fly?

**A:** Relatively speaking, no. In many ways, a good jet model is easier to fly than the average propeller plane. Since the jet model has a small-diameter impeller instead of a big prop, there are no engine torque or "P" factor problems to deal with during takeoff or vertical maneuvers. Even on a windy day, a jet model will perform flawlessly. (Have you ever wondered why so many scale competitors fly jets?)

There isn't any prop-driven wind blast over the elevator and rudder-control surfaces, so yaw and pitch control rely on forward airspeed alone. For ground steering during the takeoff roll, a jet relies on its nose wheel much more than it does on the rudder. Takeoffs of 125 to 200 feet are normal for jet aircraft, so the smoother the runway, the faster the jet will reach flying speed and become airborne. On the positive side, jets tend to go where they are pointed during the takeoff roll.

During landing, be prepared to use throttle (not elevator) to control the rate of descent. As a jet slows down, the control functions may become less effective as airspeed diminishes. You cannot simply turn onto final, pull the throttle back and expect the usual propeller drag to slow the model. You will have to plan your approaches more carefully. Landing speed for a jet is usually higher than that of a prop aircraft because of the jet's clean, aerodynamic shape.

**Q:** Are special fuel systems necessary? How big are the tanks?

**A:** Fuel tanks specifically designed for jet aircraft are available from BVM, Sullivan\* and Yellow Aircraft\*. These tanks (often called saddle tanks) are usually long and thin with a semicircular shape so they can fit between the thrust tube and the fuselage. Most ducted-fan jets have an average fuel consumption rate of about 1½ ounces per minute, so a twin-tank setup totaling 24 ounces of fuel

will permit a safe flight time of 10 to 12 minutes. Considering that most jets fly at more than 120mph, this is plenty of time for the average modeler.

*The Jet Hangar Hobbies F9F-4/5 Panther is a good place to start. Powered by a Turbax fan unit and a K&B .48, the model has good performance.*

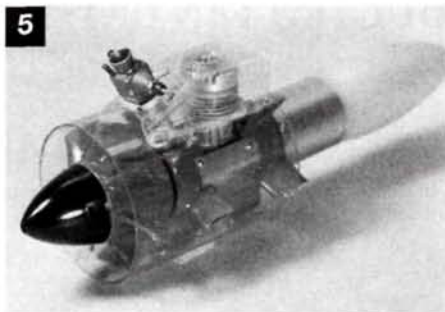
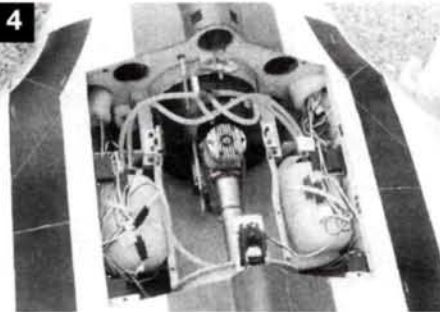


*Another very popular model is the Jet Hangar Hobbies F-86 Sabre Jet. Also powered by a Turbax/K&B .48 power system, the Sabre has excellent slow-speed flying traits.*

**Q:** I see a lot of jet kits in classified ads, on the Internet and at swap meets. Are these good places to get my first jet?

**A:** Jet manufacturers today offer products that are extremely well-designed and engineered. Though older products will certainly fly well when assembled properly, the quality of a model assembled by someone you don't know personally might be questionable. You may find a true bargain out there, but often, additional costs must be incurred to get a used jet properly assembled and flying. In the long run, the higher relative cost of a new kit is a better investment toward success.

The same could be said for fan units and engines. Be very leery of items that are several years old. Are replacement parts still available? Will it generate enough thrust to fly your model? Using new engines and fan units eliminates any question of reliability. And new equipment usually comes with some form of warranty; used stuff does not. As with anything else—buyer beware.



1. This MiG-21 has a very large main hatch, and with it removed, you can see the engine hatch and the air-inlet duct. If you look closely, you'll see a saddle fuel tank between the inlet duct and the fuselage's inner wall.

2. With the main hatch removed, you can see the BVM Viojett unit and the removable engine access hatch cover. Note that O-ring keepers are used to hold the engine hatch securely in place.

3. The Viojett fan unit from BVM is used to power many jet models.

4. This is the engine compartment layout of the Mark Frankel-designed F-4D Skyray. Note the twin fuel-tank setup and the remote mixture-control valve above the fan shroud.

5. This RK-720 from Kress Jets uses an O.S. .21 buggy engine for power. Note the extension added to the carb neck and the stator blades at the rear of the shroud. The long white cone is the Kress Bullet fuel tank.

Figure 1. Tractor-fan unit (side view)

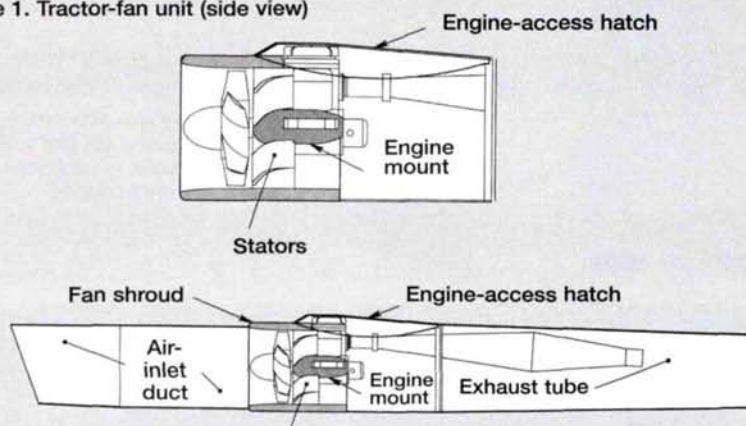


Figure 2. Tractor-fan unit (top view)

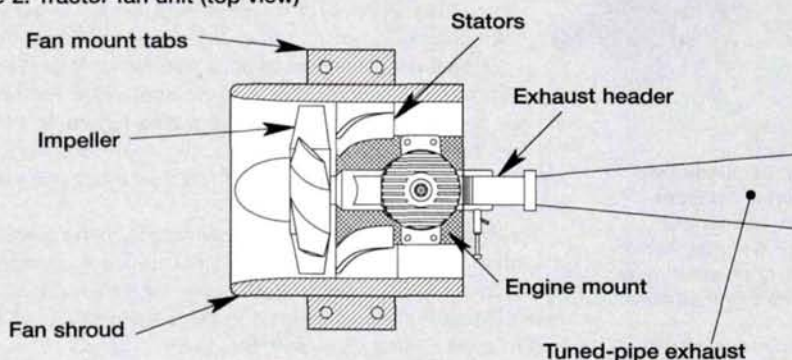
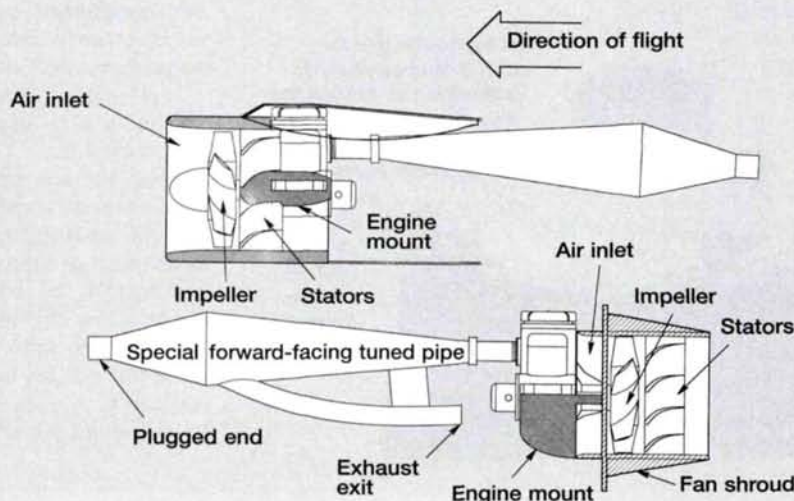


Figure 3. Tractor- versus pusher-fan configuration



are intended for smaller 8- to 12-pound jets with wingspans of between 50 and 60 inches. The RK-740 and Turbax fans are well-matched with .45 to .65ci engines. (Kress also offers smaller glow-fan units and units specially designed for electric power.) For information on other fan units, see the kits chart included with this article.

## THE BASICS

A ducted-fan setup includes an air inlet, an impeller (fan), the engine and engine mount and an exhaust thrust tube (see Figures 1 and 2). As the air is drawn into the fan, it is accelerated to a very high velocity. As the airflow is routed into the fan unit and out of the thrust tube, it generates the thrust that propels the aircraft forward.

Although all of the fan unit's parts are important, the impeller blades are most critical for the unit's performance. The outer fan shroud helps direct airflow rearward and prevents "tip losses," i.e., power-robbing inefficiencies caused by air vortices formed at the blade tips. If there is too much space between the tips of the blades and the inner shroud wall, air vortices can interrupt the smooth airflow. After the air has exited the impellers, fixed, blade-like structures called stators straighten the swirling airflow produced by the fan and channel it rearward.

Always match the fan unit to the engine you want to use. Using a fan unit that's too small or an impeller that has too little pitch can cause the engine to exceed allowable rpm limits. This can lead to engine failure, which typically occurs when the connecting rod breaks.

Conversely, using a fan that's too big or that has too much pitch will prevent the engine from reaching its peak rpm and will cause it to overheat, thereby preventing the fan from generating sufficient thrust.

## TRACTOR OR PUSHER?

There are two types of ducted-fan units: pusher and tractor. In a pusher fan, such as the Byrojet, the engine, exhaust header and tuned pipe all sit in front of the fan. The Turbax, Dynamax, Viojett, RamTec\* and all other units in which the engine, header and pipe sit behind the fan are referred to as tractors (Figure 3).

Part of the thinking behind the pusher design is that when the airflow through the exhaust tube is uninterrupted, more power can be used to boost exhaust velocity. The tractor design relies on smooth, high-velocity airflow drawn into the impeller blades to make the fan unit efficient. The air must flow past the engine and exhaust pipe so, to maximize thrust, various fairings cloak the engine to minimize drag behind the impeller blades.

Pusher fans have slightly larger diameters than tractor fans; they develop significant thrust at the beginning of the

## DUCTED-FAN UNITS

Name	Type/size (in.)*	Distributor	Comments
Byrofan	P/6	Top Gun Models	Designed by Byron Originals; pusher configuration requires special pusher tuned pipes
Dynamax	T/5	Jet Model Products	
RamTec	T/5	Aeroloft Designs Century Jet Models	
RK-049	T/3	Kress Jets	All Kress fans have integral "bullet" fuel tanks
RK-049P	P/3		
RK-709	T/3		
RK720	T/3.25		
RK-20	T/4.13		
RK-740	T/4.13		
Turbax	T/5	Jet Hangar Hobbies	Suitable for all JHH kits; ideal for new K&B .48 DF engine
Viojett	T/5	Bob Violett Models	VioFan is BVM's newest fan unit. Coupled with BVM's .96 fan engine, it's ideal for newer, larger jet models
VioFan	T/5		

\*(T = TRACTOR; P = PUSHER)

## POWERING UP

Ducted-fan jet models are only as good as their engine and fuel-system setups, so pay special attention when installing these systems. The engine and fan unit should be installed properly using the manufacturer's recommendations for tuned-pipe length and impeller size, and the fan unit should be securely and properly installed. Most of today's fan units

come with impellers that are well balanced and ready to use, but you should check the fan on a balancer just to make sure. Because of the very high rpm produced by ducted-fan engines, vibration can be a major issue if the fan is out of balance.

The majority of ducted-fan engines are short-stroke, rear-intake and -exhaust designs, and all use a tuned-pipe exhaust system.

Many engines specifically designed for ducted-fan use are available from Bob Violett Models, O.S., Rossi and K&B, just to name a few. An exhaust header and a coupler of some sort are used to connect the pipe to the engine, and most pipes are available already "sized" for the engine you are using. Just put the pipe in place and go. Rear-induction engines have either a disc or drum intake valve, and these days, almost everyone uses a remote needle-valve setup. This makes it easier to adjust the carb, as you can mount the remote needle-valve assembly anywhere outside the fan shroud.

Fuel systems have pretty much been standardized, and installation is rather



**In-flight fuel-mixture control valves such as these are standard equipment for many modelers. The one on the left is from Jet Model Products, and the one on the right is a BVM unit. Both work the same way and allow an auxiliary channel to be used to tweak the engine's fuel mixture.**

simple. Most ducted-fan models require two saddle tanks to keep the fuel mass as close as possible to the model's CG. For consistent fuel flow throughout the entire flight, an exhaust-pipe pressure tap is used to pressurize the fuel system. Many modelers also use a small 2- or 4-ounce hopper tank mounted close to the engine to further enhance engine performance. The hopper tank (also referred to as a bleeder tank) prevents air bubbles from entering the carb and compensates for any fuel-flow surges caused by high-G maneuvers (see Figure 4). I show a simple pressure tap in my illustration, but there are several kinds of pressure fittings to choose from. Check your fan unit's manufacturer's recommendation.

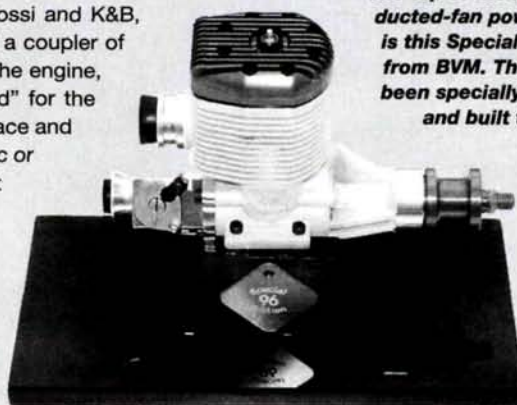
The two main saddle tanks are connected to the pressure tap with a T-fitting. The outlet tubes of the tanks are also connected with a T-fitting to deliver the fuel to the hopper tank's vent line. The hopper tank's outlet is then connected to the engine's carb or to a remote fuel-mixture control valve and then to the engine.

The saddle tanks are shaped to fit up against the fan unit and to save space within the fuselage. To provide consistent fuel flow, both of the saddle tanks (and the hopper tank, if used) should be mounted with their centerlines at or slightly below the carb's centerline. For

easy identification, use tubing of different colors for the pressure and fuel lines.

An in-flight fuel-mixture control is also standard equipment today. Though it requires an auxiliary radio channel to operate, in-flight mixture control helps maintain maximum performance by allowing you to tweak the fuel mixture's lean or rich setting. Using this mixture control, you can tune your engine for maximum takeoff per-

**The top of the line for ducted-fan powerplants is this Special Edition .96 from BVM. The engine has been specially designed and built to produce maximum power and is well-suited to large, ducted-fan models.**



takeoff run and produce good initial acceleration. Once airborne, however, they do not develop as much airspeed as tractor units do; a pusher fan's top speed rarely exceeds 120mph. Though they require more takeoff distance and have less initial acceleration than pusher fans, tractor fans develop more top-end thrust and much higher airspeeds—in the 150 to 180mph range.

Another obvious difference between the tractor and pusher fan units is how they are mounted to the airframe. Tractor units have side rails or mounting tabs that are bolted to a mounting plate within the fuselage. Most, if not all, pusher-fan units are attached to a vertical bulkhead in the airframe.

Tractor fans are the standard configuration and account for most of the fan units used today. Again, it is up to the individual which type of fan to choose. The best advice is to use the type of fan suggested by your kit's manufacturer.

### INLETS

Inlets are the ducts at the front of a jet that channel air into the fan. As with nearly everything else on a jet model aircraft,

**Starting a ducted-fan engine that's mounted deep within a jet model requires a starting wand. Inserted either in an intake or an exhaust duct, the wand has a large hex-head driver that is inserted into the fan's hub.**

inlet design is important for good performance. Aircraft designed around the Byrojet pusher fan unit often do not have any inlet ducting. This is because the engine/header/pipe assembly is in front of the fan, and an inlet duct would have to be designed to route air around it. Often, pusher aircraft rely on an auxiliary air intake (cheater hole) on the underside of the fuselage to permit sufficient air to flow



**The Viofan is the latest development from BVM. Here, you can see the tight-fitting engine fairings, the remote mixture-control valve and a specialized pressure fitting at the end of the tuned pipe.**

**Below right: ducted-fan engines are high-revving, rear-intake and rear-exhaust powerplants, and they use tuned pipes to develop maximum power. The O.S. .91 VR-DF is a very popular engine. Below left: here, you can see the rear-exhaust port and rear-mounted carb on this Rossi .53 engine. The large, air-cooling head is a feature of pusher-fan engines.**



formance, then richen the mixture slightly after you've become airborne.

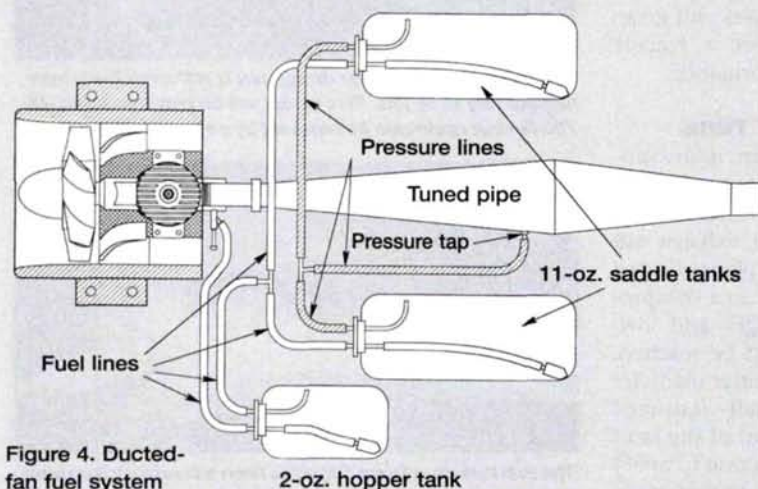
### KEEP IT CLEAN

It doesn't take much to foul up a fuel system, so to maintain engine reliability, always use a filter. Use a fuel filter between your field-box fuel pump and your tanks when filling up as well.

Specially formulated fuels and glow plugs are recommended for ducted-fan engines. To obtain optimum performance, ducted-fan engines require fuel that contains a certain quantity of high-quality lubricant oil. Many jet fliers add a capful of BVM's Metalon or Boca Bearing\* Midas Touch to a gallon of fuel as a precaution against overheating. I've had success using fuel with 10- to 15-percent nitro, and I recommend that you use fuel that contains at least 18 percent lube oil. Jet glow fuel is available from Morgan Fuels\*, BVM, Byron Originals and Wildcat Fuel\*.

Glow plugs are another personal choice, but in general, a glow plug used with a tuned-pipe exhaust system should not have an idler bar. Popular types of glow plugs are Rossi\* no. 6, 7, and 8, OPS\* 300 and the McCoy Fan Plug (available from BVM). Ducted-fan plugs are more expensive than standard glow plugs because their heating elements are made to withstand the temperatures and stresses produced by high-revving engines. Most jet pilots change their glow plugs every three to seven flights, but this is a personal choice based on experience. My advice is not to use a \$3 glow plug in an expensive ducted-fan engine.

The first time you crank up your new ducted-fan engine, you are going to hear more revs than you are accustomed to. The normal rpm range for ducted-fan engines is between 18,000 and 24,000; it varies depending on the engine and type of fan unit used. I do recommend that you protect your eyes and ears when you work on a running ducted-fan unit!



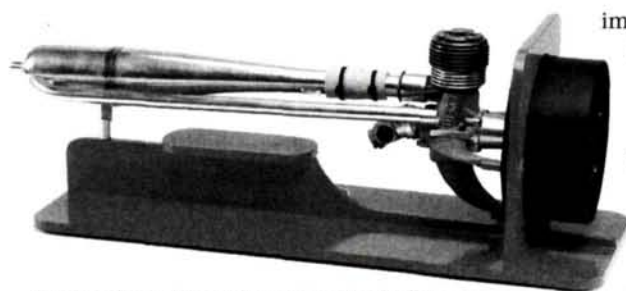
**Figure 4. Ducted-fan fuel system**

## GETTING STARTED IN DUCTED-FAN JETS

### FIRST FAN KITS

Company	Name	Construction	Wingspan (in.)	Length (in.)	Weight (lb.)	Retracts (yes/no)	Fan type*/diameter (in.)	Engine	Price
<b>Aeroloft Designs</b>	Value-Jet (no hardware)	Wood/foam	67	60	8-10	N	T/5	.45-1.00	\$195
	A-7 Corsair	F/F**	64	72	12-14	Y	T/5	.91	\$685
<b>Bob Parkinson Flying Models</b>	New Regal Eagle	Wood/foam	53	68	9-11	Y	T/5; P/6	.65-.91	\$169
	Jaguar trainer jet	Wood/foam	51	60	11	Y	T/5	.65-1.00	\$369
<b>Bob Violett Models</b>	Maverick	F/F	60	67	13-14	Y	BVM T/5	.91-.96	\$795
	Balsa Bandit	Glass fuse/wood wing	64	72	16.5	Y	BVM T/5	.91-.96	\$1,195
<b>Century Jet Model</b>	Sport Hawk Mk. IV	F/F	59	51	10-12	Y	T/5	.82-.91	\$395-\$795
	MiG-15	F/F	74½	74	16-18	Y	T/5	.91-1.00	\$650-\$1,450
<b>Crow Aviation Inc.</b>	Raven	F/F	56	64	11-12	Y	T/5	.65-1.05	\$995
<b>DL Aeromodels</b>	Cyclone (trainer)	F/F	60	70	12	Y	T/5	.77-.91	\$599
	Aermacchi	F/F	64	67	14	Y	T/5	.9	\$699
<b>Jet Hangar Hobbies</b>	F-86F Sabre Jet	F/F	50½	50½	8	Y	Turbax T/5	.48	\$425
	F9F-4/5 Panther	F/F	52	56	NA	Y	Turbax T/5	.48	\$475
<b>Jet Model Products</b>	Starfire IIC	F/F (epoxy/carbon fiber)	50¼ in.	62¼ in.	10-11 lb.	Y	Dynamax T/5	.91	\$545
<b>JD Enterprises</b>	F-4	Wood	35	50½	5	N	T/4 or 5	.25-.45	\$159.99
	F-15	F/F and wood	42	59	7	Y	T/5	.45	\$259.99
<b>Model Specialties</b>	F4D-1 Skyray	F/F	57½	77½	18-21	Y	T/5	.91	\$895
<b>Nick Zirolli Plans</b>	F9F-Panther (plans)	(Call for kit and parts)	72	72	15-18	Y	T/5	.91	\$38 (plan only)
<b>Planes Plus/FiberClassics</b>	F-86 Sabre Jet	Fiberglass	75½	72	18½-22	Y	T/5	.91	\$1,995
<b>Rich Uravitch</b>	T-33	F/F (laser-cut wood)	64	57¼	10-13	Y	T/5	.65-.91	\$389.95
	P-80	F/F (laser-cut wood)	64	57½	10-13	Y	T/5	.65-.91	\$389.95
<b>Top Gun Aircraft</b>	F-15 Ultra Eagle	F/F	51	67	10-12	Y	T/5; P/6	.91	\$379 and up
	MiG-29 Fulcrum	F/F	53	76		Y	T/5; P/6	.91	\$399 and up
<b>Yellow Aircraft</b>	Starfire II	F/F (polyester glass)	50¼	62¼	10-11	Y	T/5	.91	\$495
	A-4 Skyhawk Sport wing	F/F	45	56	9-11	Y	T/5	.91	\$395

\*Fan type: T = tractor, P = pusher \*\* F/F = foam and fiberglass



**Pusher-fan units such as this 6-inch-diameter Byrofan attach to a vertical former in the model. Available from Top Gun Models, the Byrofan (powered by a CMB .65) requires a special pusher tuned pipe. Also note the special three-web engine mount used to attach the engine to the fan shroud.**

into the impellers.

With so much air being pulled into the impellers and with good low-end acceleration, a Byrojet pusher fan is an excellent choice for modelers who fly from a grass runway.

The key to the tractor-fan unit's high-speed performance is in the design of the inlet ducting system. Because 5-inch tractor fans spin at a higher rpm than do 6-inch pusher fans, smooth air entry into the tractor-fan unit is more

important for maximum efficiency. The smooth internal-inlet ducting allows the air to be rammed into the fan unit at high velocity.

Poorly designed or improperly built air inlets will greatly affect a tractor fan's performance.

#### EXHAUST TUBE

To maximize thrust, many full-size, high-performance jets can increase and decrease the diameter of their exhaust tail cone. Our model planes do not have that luxury, so a compromise between high- and low-speed thrust must be reached. To do this, the outlet diameter of a model is usually restricted to 80 to 90 percent of the fan's diameter. This is done to avoid putting too much backpressure on the fan unit while still providing enough thrust to fly



**This Tommycat is an older design but is still a relatively inexpensive way to fly jets. This model will be powered by an RK-720 fan but could also be powered by an electric-fan unit.**



**The Bob Parkinson Regal Eagle has been around for a long time. Bob has enlarged the design and offers the model in kit form at a very reasonable price. This Eagle and my MiG-25 painted version in the background are both powered by the Byrojet pusher jet.**



**Right: the Fulcrum MiG-29 available from Top Gun Models is powered by either a pusher- or tractor-fan unit.**

efficiently. My advice here is to stick with the recommendations of the fan unit's manufacturer or the model's designer. As is the air-inlet ducting, the exhaust tube is made of thin fiberglass cloth and resin supported on the outside by the fuselage; its interior finish is very smooth.

### WHAT MAKES JETS FAST?

Besides all of the engine and fan design work, what makes model jets so fast is their aerodynamically clean lines. The fuselage and control surfaces are smooth, and fillets and fairings minimize drag. For maximum speed, retracts are mandatory, as are tightly fitting hinge gaps on all control surfaces. To further clean up the airframe, gear doors and tight-fitting access hatches are used. Sufficient power, a clean airframe and properly installed fan ducting all contribute to the speed of jet models.

All the things that enhance the air-speed of the jet also contribute to excellent glide performance. You'll also see that things such as flaps and speed brakes become necessary to slow down a jet for better landing performance. When all is said and done, for jets, speed is the name of the game.

### CONCLUSION

Ducted-fan jets are fast models that require good building and flying skills. They require a knowledge of fiberglass and foam construction techniques and demand a higher degree of maintenance than your average prop-driven aircraft. Engine care and tuning are important for maximum performance, and an adequate flying field is a requirement. A paved runway is not always required but is a plus for the serious jet modeler. No one is a born jet pilot. If you want to fly jets, don't let anything stop you from learning the skills required to succeed. Take your time, evaluate yourself, choose a model and take the first step.

*\*Addresses are listed alphabetically in the Index of Manufacturers on page 134. ★*

## 2000 JET EVENTS SCHEDULE

**Jets Over Deland**, held annually in January in Deland, FL. Contact Tom Beckman or Bob Bartoe, (904) 228-0700.

**Florida Jets**, held annually in February/March in Burnell, FL. Contact Frank Tiano, (561) 795-6600; ftiano@aol.com.

**Tucson Fan Jet Rally**, held annually in March in Tucson, AZ. Contact Bob Reynolds, (820) 296-8183; va89490@cae802.tu.hac.com.

**Dallas/Fort Worth Jet Rodeo**, May 6-7, Dallas, TX. Contact Patrick Fernandez, (214) 823-1527.

**Okefenokee RC Jet Rally**, May 6-7, Homerville, GA. Contact Allen Smith, (912) 285-8022.

**Mississippi Afterburner**, May 20-21, Winona, MS. Contact Dennis Lott, (601) 856-3377; rugbaron@netdoor.com; or Vernon Montgomery, (601) 924-8443.

**Central Texas Jet Rally**, June 3-4, Austin, TX. Contact bobcovish@aol.com.

**Lilac City Jet Rally**, June 8-9, Spokane, WA. Contact Doug Hunt, (509) 327-1180; or Charlie Hissom, (509) 466-0827.

**Best of the West**, June 9-11, Denver, CO. Contact Nat Lancaster, (303) 988-2081; nat@pcisys.net.

**Greater Cincinnati Jet Rally**, June 17-18, Oxford, OH. Contact (513) 742-0767; members.aol.com/MTAINDY/CINCINNATI.html; amato\_jj@hcca.org.

**Michigan Jets**, July 28-30, Grosse Isle, MI. Contact Stan Spiewak, (248) 626-8838; beisenb652@aol.com.

**Field of Dreams Fan Fly**, July 29-30, Broken Arrow, OK. Contact Kent Landefeld, (918) 342-5781.

**Jets Over Palos**, August 5-6, Palos Park, IL. Contact Jerry Bernard, (708) 594-2998; jetflyer1000@aol.com.

**Missouri Valley Jet Scramble**, early August, Lincoln, NE. Contact Rob Skiba, (402) 896-3838; rskiba@home.com.

**Catapult Jet Rally**, early August, Lakehurst, NJ. Contact Sal Piu, (732) 349-4883; spiuro@adelphia.net.

**LaChute Jet Rally**, mid-August, Quebec, Canada. Contact J.G. Rochefort, (613) 632-4701.

**Heart of Ohio**, Aug. 25-27, Columbus, OH. Contact George Reverman, (614) 274-7853.

**Jets Over Whidbey**, August 26-27, Coupeville, WA. Contact Roy Holt, (253) 891-2437; www.frgal.com/~royholt/whidbeyjets/ind.

**Maine Jet Rally**, Sept. 9-10, Biddeford, ME. Contact Anthony Parchment, (207) 883-5327; or Ray Labonte, (207) 797-5196; www.icommercetools.com/mainjets.

**Greater Southwest Fan Fly**, Sept. 15-17, Caddo Mills, TX. Contact Kevin Whitlow, (972) 418-6657.

**Last Chance Jet Rally**, October, Colorado Springs, CO. Contact Ivan Munninghoff, (719) 683-3218.

**Superman 12**, Oct. 5-8, Metropolis, IL. Contact Jerry Caudle, (618) 524-9979; promark@promark.

**Florida Intl. Jet Rally**, Oct. 20-22, Lake Wales, FL. Contact Steve Jaworski, (813) 752-2420.

**Arizona Jet Rally**, Nov. 18-19, Mesa, AZ. Contact Bob Ruff, (602) 892-1510.



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# The ABCs of Balsa

by Randy Randolph

## A closer look at modeling's mainstay

**A**LTHOUGH LITE-PLY, foam, plastics and composite materials like carbon fiber are all used in model airplane construction, the leading building material—balsa—is the same as it was 75 years ago. Because balsa is a staple in model airplanes, it is essential that a modeler know something about this wonderful wood.

Despite the care taken by manufacturers, occasionally substandard wood finds its way into kit boxes. If you're knowledgeable about balsa and its characteristics, for only a few cents, you can replace these pieces with wood from your dealer's stock and thereby avoid trouble and frustration.

Most of the world's supply of balsa, considered a hardwood in the lumber business, comes from plantations and the wilds of Central and South America. It takes seven years for a tree to grow to a size suitable for harvest. When cut, the trees must be dried to remove their very high moisture content before the balsa can be processed for shipment.

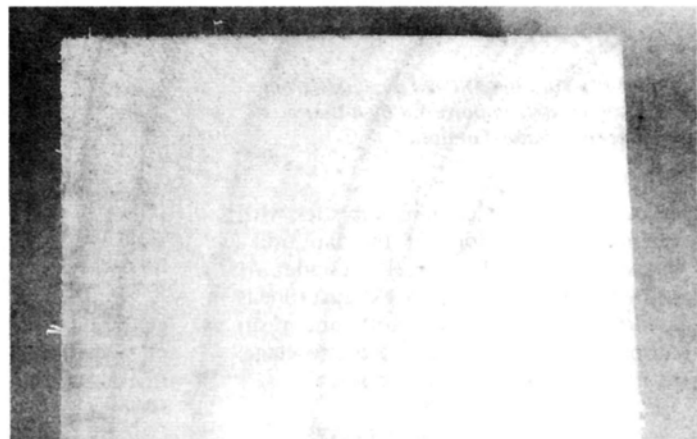
The demand for balsa is high! Shipping, construction and aircraft industries as well as the military's demand for balsa is in the tens of millions of board feet each year. This demand requires high production, which keeps the price stable. In today's world, balsa is a bargain! If the exporters of balsa depended solely on the model trade, the cost would approach that of a precious metal!

To understand the differences in balsa sheet, look at a cross-section of a balsa block. The concentric ridges that get larger the farther they are from the tree's center are called "annual rings." Look closely, and you will see streaks that radiate outward from the center like the spokes of a wheel. These are the medullary rays. These rays, and the angle at which a sheet of wood is cut to them, give the sheet its grain characteristics.

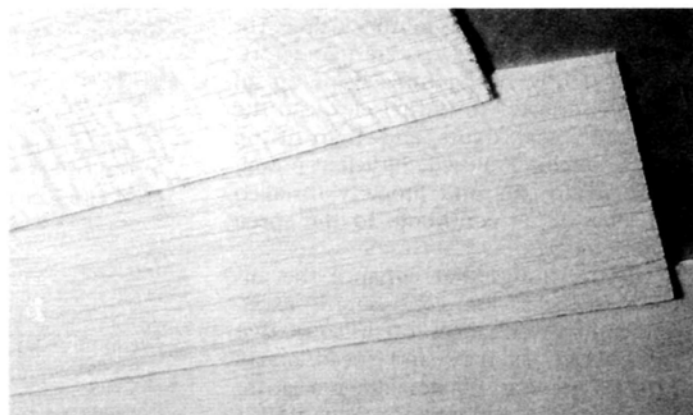
There are three basic types of grain in balsa: A, B and C. The actual grain always runs lengthwise down the sheet, and the grain types are based on the sheet's relationship to the medullary rays when it was sawed off the log. A-grain is cut with the rays perpendicular, or nearly 90 degrees, to the face of the sheet, and it is very flexible. It is excellent for sheeting curved surfaces and can be soaked in water and wrapped into a tube. B-grain is cut so that the rays intersect the face of the sheet from 40 to 70 degrees and is the most common. It is a general-purpose wood that can be used for most applications. C-grain, or quarter-grain, as it is sometimes called, is cut with the rays perpendicular to the edge of the sheet. C-grain has a mottled, almost iridescent appearance, and it is very stiff across the face of the sheet. It is used where rigidity is important, as in ribs and formers. Look at the cross-section of the balsa block: A-grain sheets would be cut along the left side, B-grain along the top and C-grain along the bottom. As you can see, there are very few true A and C cuts from each log; but the 10- to 20-degree variance makes little difference in application.

Along with grain types, the weight of the balsa from where the sheet was cut is stated in pounds. Light or indoor wood is in the four- to six-pound range, medium is six to eight pounds, and 10 and over is heavy or hard. Balsa is also available in weights of 15 pounds or more, but spruce or pine works better for model work in that weight.

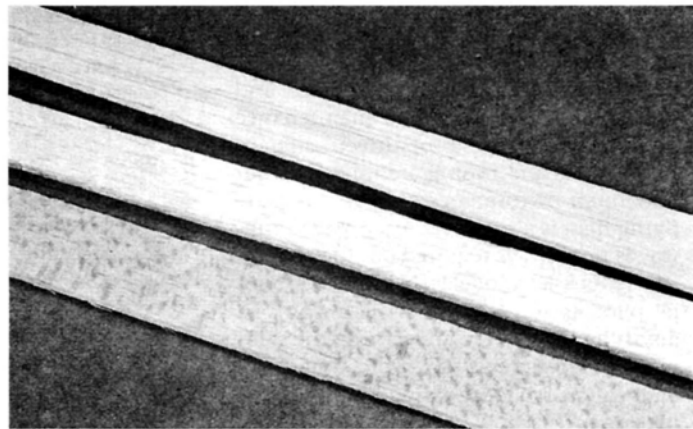
Balsa is really a wonderful wood! Carving it with a knife is almost sublime. The softer grades respond gently to a sharp blade, yet in the harder grades, the wood can fight back like a cornered cat. Pay attention to the balsa that's provided in your next kit; the best way to learn about balsa is to use it. ⚡



The end grain of this balsa block shows the annual rings as well as the medullary rays. The medullary rays are difficult to see but important when it comes to understanding the characteristics of a sheet of balsa.



These balsa sheets show what to look for when you select a particular grain type. The C- or quarter grain (top) has a mottled appearance, the B-grain (middle) has only slight mottling, and the A-grain (bottom) has a clear, straight grain.



Now for a test! From top to bottom, name the grain type of these three strips.

Answer: A, B, C.



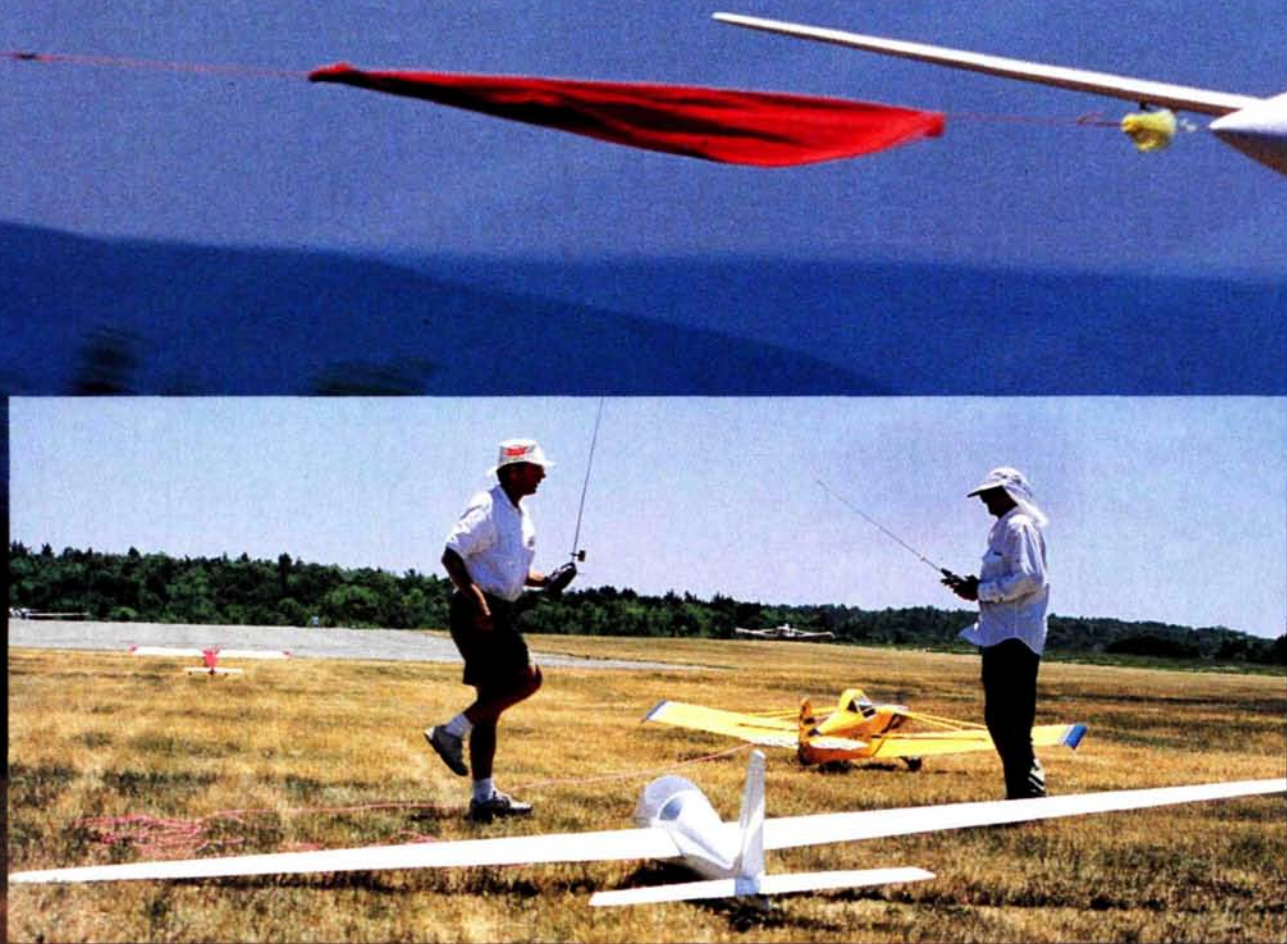
# INTRODUCTION TO AE

## A TEAM APPROACH TO SAILPLANE LAUNCHES

**A**erotowing is growing rapidly, both in interest and sophistication. The grace and majesty of a large-scale sailplane launched by aerotow—plus the unparalleled opportunity for cooperation and interaction between pilots of sailplanes and powered planes—has fueled an explosion in the number of pure aerotow events held in recent years in such diverse locations as Elmira, NY, Fayetteville, NC, Pensacola, FL, Los

Banos, CA, Yakima, WA, and Ontario, Canada.

RC model aerotowing has come of age. For decades, it has been the most common way to launch full-scale sailplanes, and it is now recognized as the safest way to launch large, long-span, scale model sailplanes. This article seeks to illuminate the fundamental concepts needed by those new to aerotowing, so they may succeed on their first try at this cooperative endeavor.



Left: Eric Meyers, sailplane pilot of Bruckmann\* 1/8-scale Fox and Robin Lehman, tug pilot, with Bruckmann 1/4-scale Piper Pawnee (photo by Dave Garwood).

## CHOOSING A GOOD TOWPLANE by Robin Lehman

An ideal tow combination is one that the towplane and the sailplane pilot can fly easily. You need to have a towplane that will be happy flying at a speed that's also comfortable for the sailplane. Some powered aircraft have a very wide speed envelope and can fly quite slowly or quite fast and are very easy to fly throughout this airspeed range. These aircraft are usually good towplanes and can tow all types of gliders. What makes a good towplane?

- It should be very stable, easy to fly and easy to land.
- It should have rugged landing gear and be able to withstand many landings and takeoffs.
- It should be over-powered. It should be able to take off and climb gently on 1/2 power. As a general guideline, your towplane should have 1 1/2 times

the weight of the towplane in thrust.

The smaller the towplane, the more difficult it is to use to aerotow; however, you can tow light gliders ( $\pm 5$  pounds) with 1/8-scale Piper Cubs, a variety of trainers, or .40-size Telemasters. Smaller towplanes are more difficult to fly and harder to see at altitude, so it's easier to learn to aerotow with a larger towplane.

If you plan to try to aerotow a glider with a .40-size towplane, find one that has a generous wing area as opposed to something like an aerobatic Extra which, at that size, would make a very poor towplane indeed. Almost any trainer will do.

Your airspeed is governed by lift and drag. A .40-size aircraft tends not to have all that much drag because its wings are relatively small. On the

# ROTOWING

by Dave Garwood



*A model Piper Pawnee tows up a model ASW 22. Perfect tow position! (photo by Robin Lehman).*



**Background shot:**  
Eric Meyers' Bruckmann  $\frac{1}{8}$ -scale Fox on tow (photo by Dave Garwood).  
**Right:** David Derstine with John Derstine's\* purpose-designed Pegasus aerotow tug, which is available in a kit. Wingspan—109 in.; length—78 in.; weight—26 to 34 lb.; engine—Brison 4.2 and up (photo by John Derstine).



other hand, larger powered aircraft can get very draggy, and some wonderful flying models make rather poor towplanes because of that. For this reason, monoplanes are better towplanes than biplanes.

Some larger monoplanes make lousy towplanes because they are too draggy. A perfect example is a  $\frac{1}{8}$ -scale Piper Cub. This size Cub (12-foot span) has a lot of wing area and will need a lot of excess power just to fly it through the air fast enough to tow a  $\frac{1}{8}$ -size sailplane. On the other hand, a  $\frac{1}{8}$ -scale, clipped-wing Cub makes an excellent towplane.

In Germany, towplane pilots are very weight conscious and make their models as light as possible. We would be well advised to do the same.

Bigger is better. One of the reasons that larger airplanes fly better is because they have relatively light wing loadings. Quite frankly, that's the

only reason some of us have such large sailplanes and towplanes! No, we don't enjoy building such large models, dealing with such large engines and paying for such large, relatively expensive kits, but we *do* enjoy flying such pussycats in the air!

Remember: choose a towplane that's over-powered and very easy to fly and land, and match the airspeed of your towplane with your sailplane. Make sure that you have a good tow pilot—one who's capable of flying an airplane where he wants to put it.

With all of these ingredients, you should have many years of problem-free aerotowing. It's a blast and the best way to get your sailplane way up in the blue yonder!

## AEROTOW RELEASE MECHANISMS by Asher Carmichael

Reliable releases on the sailplane and the towplane are requirements for successful aerotowing. Drawings of some of the more popular and effective choices are included here for your consideration.

### Keep in mind:

- All sailplane releases should be positioned either in, or in reasonable proximity to, the nose.
- All towplane releases should be positioned on top of the fuselage, either at the trailing edge (TE) of the wing or in a range between the TE and the CG of the aircraft.

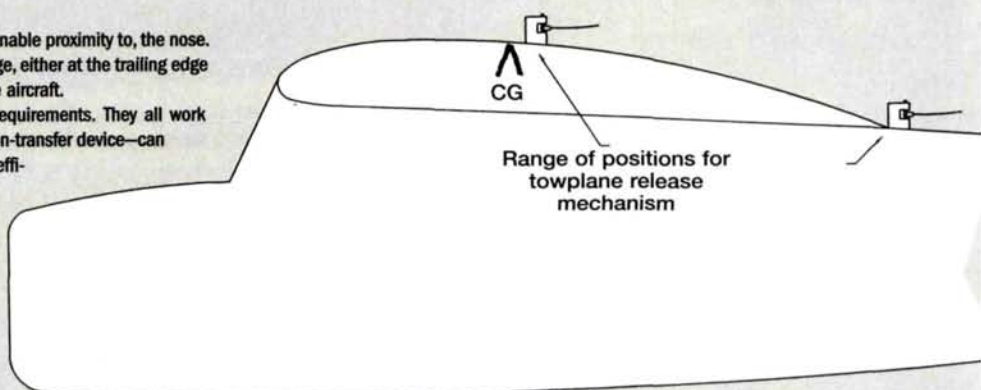
Use your imagination in adapting these releases to your requirements. They all work quite well in proper applications. A bellcrank—or any other motion-transfer device—can be incorporated as long as the total system is slop-free and efficient. Consider the forces that can be generated by a large sailplane/towplane combination when designing and choosing wire sizes for the “loop” variety of release. Wire sizes in the range of .078 to .093 inch for the loop and pushrod should be sufficient for all but the very largest sailplanes.

The commercial varieties shown in the accompanying diagrams may have limits as indicated. The “over-center” type is perhaps the best for “in the nose” positions. The leverage afforded by the cam, rather than the overall size of the release, is the determining factor for suitability in a large plane.

Even though the amount of tension on a release system may change throughout the tow because of varying flight speeds between sailplane and towplane, it is a good idea to use as large a servo as you can, especially if you are driving an additional function such as a retract. When you need to release, you don't want the release system to hesitate because of insufficient power. A servo that has 40 oz.-in. of torque is a good starting point for 1/4-scale planes. My 1/3-scale DG-600 uses a 1/4-scale retract servo that supplies 170 oz.-in. of torque to drive the release and the retract. I consider this to be minimal for this setup.

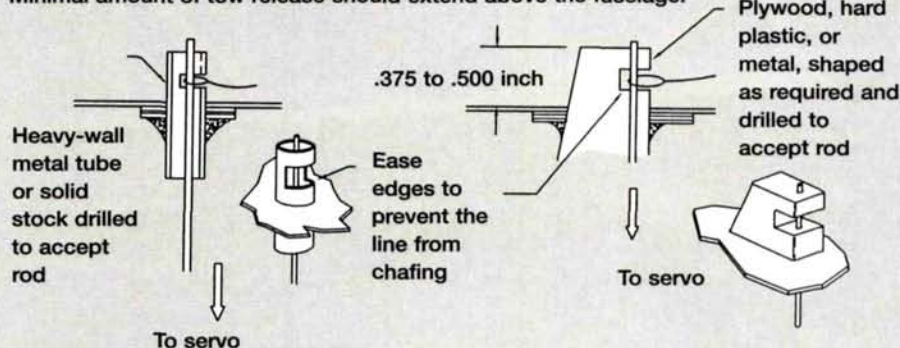
The “cross-over” design is the simplest sailplane release, and it works well in all sizes of models. It is the perfect choice for that first aerotow model, as it is easily made out of materials found in most modelers' shops. Modified versions of this release (using rigid wire and a support on each side of the hole) are used in the largest sailplane models.

**Figure 1. Range of locations for towplane tow release**



**Figure 2. Typical towplane tow-release details**

Minimal amount of tow release should extend above the fuselage.



### AIRCRAFT SELECTION AND PREPARATION

Aerotowing works best for large sailplanes—those too big and heavy to be launched safely by winch. The practical minimum span for sailplanes is 3 meters, or about 120 inches. Towing a smaller sailplane will make you feel as though you have a tiger by the tail the whole way up. In addition to towing planes with spans of

3 meters or longer, you'll want to be confidently familiar with the flying characteristics of your sailplane. Beginning aerotow launches generate enough jitters without introducing the variable of an unfamiliar sailplane.

Towplanes come in many shapes and sizes, but high power, large size and high stability are good attributes. Here are some guidelines:

For gliders that weigh up to 10 pounds and have wingspans of 3 to 4 meters, a Hobby Lobby\* Telemaster powered by a 1.08 O.S.\* 2-stroke is at the low end of the spectrum, and a scale Wilga with a Brison\* 4.2 is at the high end. The static thrust of the engine and propeller combination should be roughly equivalent to the weight of the towplane. For example, a Telemaster should pull about 13 to 15 pounds of thrust.

For 10- to 25-pound sailplanes with spans of 4 to 6 meters, the minimum is a Telemaster powered by a 35cc glow or 70cc gas engine. At the higher end is a 25-pound towplane with 30 or more pounds of static thrust. A Byron\* Husky powered by an O.S. 3.2 4-stroke or Brison 3.2 tows up to 1/4-size sailplanes, as does a 1/4-scale Cub with an O.S. 1.60 twin or G-38.

Getting the sailplane ready for aerotow launch begins with fitting a towline release mechanism. A servo operates a commercially available or homemade mechanism wherein a wire captures a loop of line; advancing the wire captures the towline; withdrawing it releases the line.

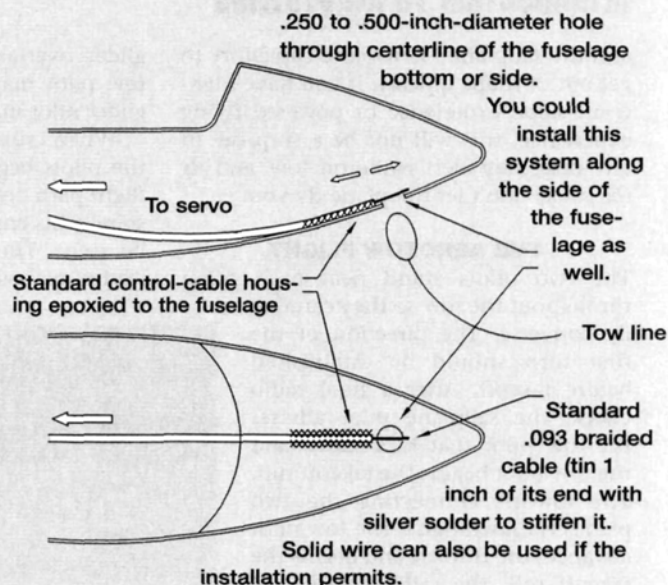
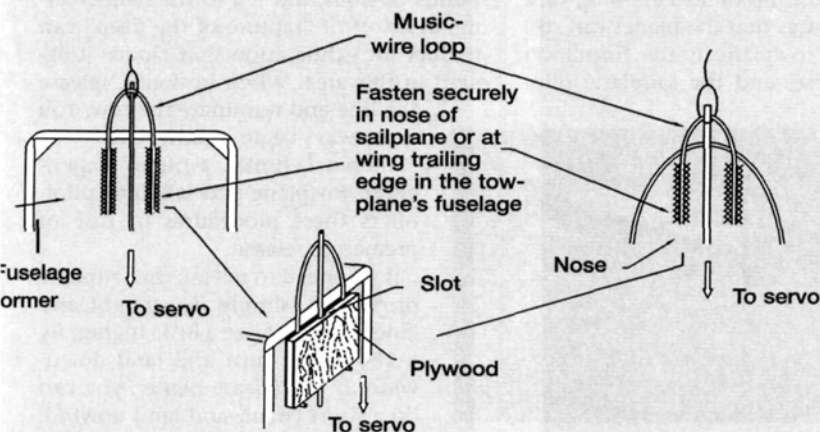
The towline capture mechanism is mounted near the nose of the sailplane,



**Dave Garwood's Dave's Aircraft Works\* EPP-foam Schleicher Ka-6E aerotow trainer on final**  
(photo by Steve Savoie).

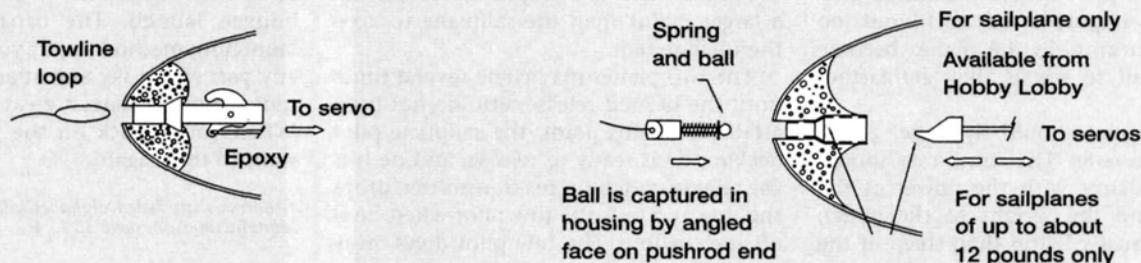
**Figure 3. Wire loop tow-release for sailplanes**

For sailplane or towplane



**Figure 4. Commercial sailplane tow-release details**

For sailplane or towplane. Available from Sailplanes Unlimited



although it does not have to be in the very tip of the nose. It is *not* mounted under the wing like a winch-launch towhook.

Scale sailplanes can use more scale-like release mechanisms that are available from suppliers such as Critter Bits\*, Hobby Lobby\* and Sailplanes Unlimited\*. Note that both the sailplane and the towplane have towline releases; if the sailplane is unable to release for some reason, the towplane can release the line.

The towline typically includes clip devices at both ends so sailplane pilots can insert a string loop into their towline release devices in the "ready" area to save time on the flightline. A swivel reduces line twisting and tangling. Some tow pilots use a stretchy section to smooth shock loads on both aircraft; others do not. A flag at the sailplane end of the towline makes it easier to confirm at a distance that the sailplane has, in fact, released the line.

Towlines are made of about 150-pound test line, but they may contain an intentionally weak link section that's designed to break the line under stress (such as when one plane departs from controlled flight, and an intentional release is not or

cannot be made).

Sometimes, a launching dolly or small wheeled cart is used, especially for training. The dolly holds the sailplane a foot off the ground, sets the wing angle of attack and fixes rotation about the three flight axes until the sailplane gets up to flight speed and gains control authority. Landing gear serve a similar purpose for the towplane. For the first few launches, the dolly makes the job easier for the sailplane pilot, as it controls some of the variables.

### THE TOW PILOT

Key to success in aerotow operations is a tow pilot who is a smooth, accomplished flier with substantial flight time on the tow aircraft. He or she must be experienced in all phases of powered RC flight and must be utterly familiar with the towplane. It's helpful if the pilot has flown sailplanes as well. The tow pilot must be able to fly large, smooth circles while towing a sailplane at a steady rate of climb until both planes are nearly out of sight.

It sounds easy, but it isn't. Practice is important. Each sailplane has unique towing characteristics, and elevator trim on

the towplane must be adjusted accordingly. The tow pilot's experience will allow him to not only fly his own plane but also to look out for the sailplane pilot, who may have less flying experience.

### THE SAILPLANE PILOT

Moderate piloting skills are all that are needed for the sailplane pilot. He should be able to confidently launch and land the sailplane and fly it both away from and toward himself, and he should have enough experience to handle both a forward stall and a single-wing stall. Experience at flying the sailplane from a substantial distance away is most helpful.

The sailplane pilot's main job is to keep the sailplane's wings level and maintain the correct height above the towplane. The towline will yaw the sailplane, and banking in turns is not needed. Sometimes, outside rudder is needed on the sailplane to keep the towline taut. Following a towplane is easier with an aileron sailplane that has rudder uncoupled than it is with a polyhedral ship.

While on tow, the sailplane will be flying faster than it does on its own. Be prepared for the snappy control responses

## INTRODUCTION TO AEROTOWING

and the sailplane's newfound capability to get out of shape quickly. If you have high-wind slope experience or powered flying experience, this will not be a surprise. In any case, stay alert while on tow, and fly the plane; don't let the plane fly you.

### THE AEROTOW FLIGHT

The two pilots stand near each other throughout the tow so they can easily converse. The direction of the first turn should be established before takeoff. After a final radio check, the sailplane pilot advises the tow pilot that he's ready, and the tow pilot begins the takeoff run. The towline connecting the two planes is drawn tight. The tow pilot advances the throttle and begins the takeoff roll; the sailplane lifts off and begins flying first. When the towplane reaches takeoff speed, it lifts off.

As soon as both planes are up and flying, probably at about 50 to 75 feet altitude, the tow pilot should establish a gentle turn. It's important not to fly out too far before turning, as the planes become more difficult to see as they get farther away.

The tow pilot should fly large, gentle circles or figure-8s. The climb rate should be in accordance with the power of the towplane and the weight of the glider; shallow is usually better than steep. If the

glider overtakes the towplane, then the tow pilot may increase his speed, or the glider pilot may feed in a little up-trim.

When cruising speed has been reached, the pilots begin a climbing turn, and the flight path on tow becomes a giant upward spiral (this ensures that the planes can still be seen). The towplane is the formation leader, of course, and the sailplane pilot

from the sailplane, quickly loses altitude, lands and sets up for the next tow. The sailplane pilot begins the search for lift or begins an aerobatic routine.

Do not fly higher than you can see. This sounds obvious, but it's worth remembering, as a sort of "rapture of the deep" can produce an exhilaration that clouds judgment in this area. When in doubt, release the line and terminate the tow. You can always begin another one.

Robin Lehman, a highly experienced towplane and sailplane pilot, offers these procedures in case of premature release:

If you need to release the sailplane on takeoff, simply fly straight and land. If you release a little higher, fly a 180-degree turn and land downwind. If you release higher, you can do a short circuit and land upwind. If you release still higher, you're home free!

The result of aerotow teamwork is a sailplane launch that is higher, gentler and more aesthetic than a winch or bungee launch. The capability of this launching method to put your sailplane in any part of the sky and at any desired altitude generally starts a great soaring flight. When you're back on the ground, you'll want to try it again.

*\*Addresses are listed alphabetically in the Index of Manufacturers on page 134. †*



Robin Lehman's super-quiet Bruckmann 1/4-scale Piper Pawnee returns after a tow run (photo by Dave Garwood).

flies slightly above the towplane to stay out of his wake. The sailplane flies turns of a larger radius than the towplane to keep the towline taut.

The two planes may circle several times until the desired release altitude has been attained. At this point, the sailplane pilot declares he is ready to release, and he hits the release switch on his transmitter, drops the line and tells the tow pilot when he is off the towline. The tow pilot dives away

### AEROTOW EVENTS

- **Pensacola Aerotow**, Pensacola, FL, February. Asher Carmichael, (334) 626-9141; acarmic985@aol.com; Rusty Rood, (850) 432-3743; fishon@aol.com.
- **Annual Aerotowing & Scale Sailplane Fun Fly**, Fayetteville, NC, May 5 to 7. Bernie Coleman, (704) 846-5219; b1rdbernie@aol.com; Wayne Parrish, (919) 362-7150; lwp42@aol.com.
- **Spring Airtow Fly-In**, Dansville, NY, May 13 to 14. Robin Lehman, (716) 385-1495; sailplanes@worldnet.att.net.
- **Los Banos, CA**, May 12 to 14. [www.sbss.org](http://www.sbss.org), or P.O. Box 2012, Sunnyvale, CA 94087, or Joe Newland, (408) 847-1291.
- **Elmira Aerotow**, Elmira, NY, June 7 to 10. John Derstine, (570) 596-4392; johnders@ptdinet; [www.geocities.com/CapeCanaveral/Lab/5739](http://www.geocities.com/CapeCanaveral/Lab/5739).
- **AMA Soaring Nationals**, Muncie, IN, July 22 to 29. (765) 289-4236; [www.modelaircraft.org](http://www.modelaircraft.org).
- **Oakville Aerotow**, Ontario, Canada, August 12 to 13; [www.omfc.org](http://www.omfc.org), or Frank Pilihi, (416) 251-1619; mirlin@directnet.com.
- **Cape Blanco Safari**, Cape Blanco, OR, August 19 to 20. Mike Shaw, (541) 269-2423; clubsos@mail.com.

• **Washington Scale Aerotow Fly-In**, Union Gap, WA, August 26 to 27. Gene E. Cope, (509) 457-9017; [gcope@ixpnet.com](mailto:gcope@ixpnet.com).

• **Fall Airtow Funfly**, Dansville, NY, September 23 to 24. Robin Lehman, (716) 385-1495; [sailplanes@worldnet.att.net](mailto:sailplanes@worldnet.att.net).

• **Triple Tree AeroTow 2000**, Greenville, SC, October 13 to 15. Eric Meyers, (864) 286-0740; [emeyers@horizonhobby.com](mailto:emeyers@horizonhobby.com).

Note: if you plan to attend, please confirm event dates; not all dates were firm at press time.

### RELATED WEBSITES

Academy of Model Aeronautics, [www.modelaircraft.org](http://www.modelaircraft.org)

Bob Bank's Scale Model Research, [www.imt.net/~ims/scale.html](http://www.imt.net/~ims/scale.html)

Fatlon R/C Soaring Information, [www.fatlon.com/sailplanes/sailplanes.html](http://www.fatlon.com/sailplanes/sailplanes.html)

League of Silent Flight, [www.silentflight.org/](http://www.silentflight.org/)

R/C Soaring Yellow Pages (at Planes, Wings and Things); [www.planes-wings-things.com/links/links.htm](http://www.planes-wings-things.com/links/links.htm)

Scale Soaring Newsletter, [www.geocities.com/CapeCanaveral/Lab/5739/tips.html](http://www.geocities.com/CapeCanaveral/Lab/5739/tips.html)

Sailplanes Unlimited, [www.sailplanes.com](http://www.sailplanes.com) (imported scale sailplanes and articles)

Calendar of events for scale sailplane enthusiasts, [www.sailplanes.com](http://www.sailplanes.com)

International Scale Soaring Association, [www.soaringissa.org](http://www.soaringissa.org)

John Derstine's Scale Soaring, [www.geocities.com/CapeCanaveral/Lab/5739](http://www.geocities.com/CapeCanaveral/Lab/5739) (Elmira Aerotow coverage and articles)

Dave's Aircraft Works, [www.davesaircraftworks.com](http://www.davesaircraftworks.com) (EPP foam KA-6 scale aerotow trainer sailplane)

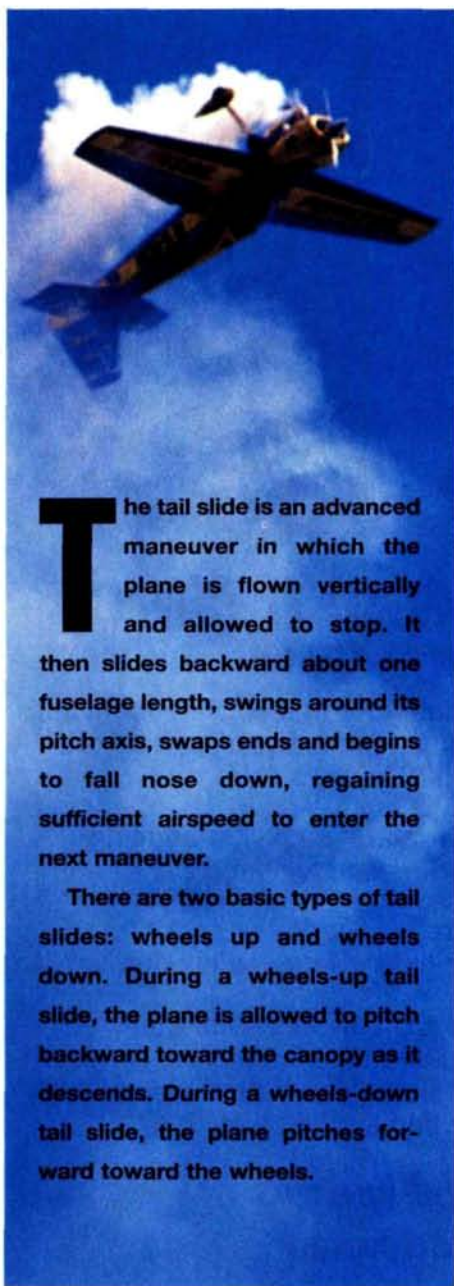
Model Aeronautics Association of Canada, [www.maac.ca](http://www.maac.ca)

### VIDEOTAPES

"Aero-Towing"; \$19.95—John Clarke, The Creative Image of New Hyde Park, 911 Covert Ave., New Hyde Park, NY 11040; (516) 775-4780; [TCI@ix.netcom.com](mailto:TCI@ix.netcom.com). (PAL and Secom formats also available at extra charge)

"Elmira Aerotow '97"; \$19.95 (plus \$3 S&H), and "Ultimate Scale Soaring '98"; \$24.95 (plus \$3 S&H)—John Derstine, RD 3, Box 366, Gillett, PA 16925; [ejohnders@postoffice.pds.net](mailto:ejohnders@postoffice.pds.net).

# Performing tail slides

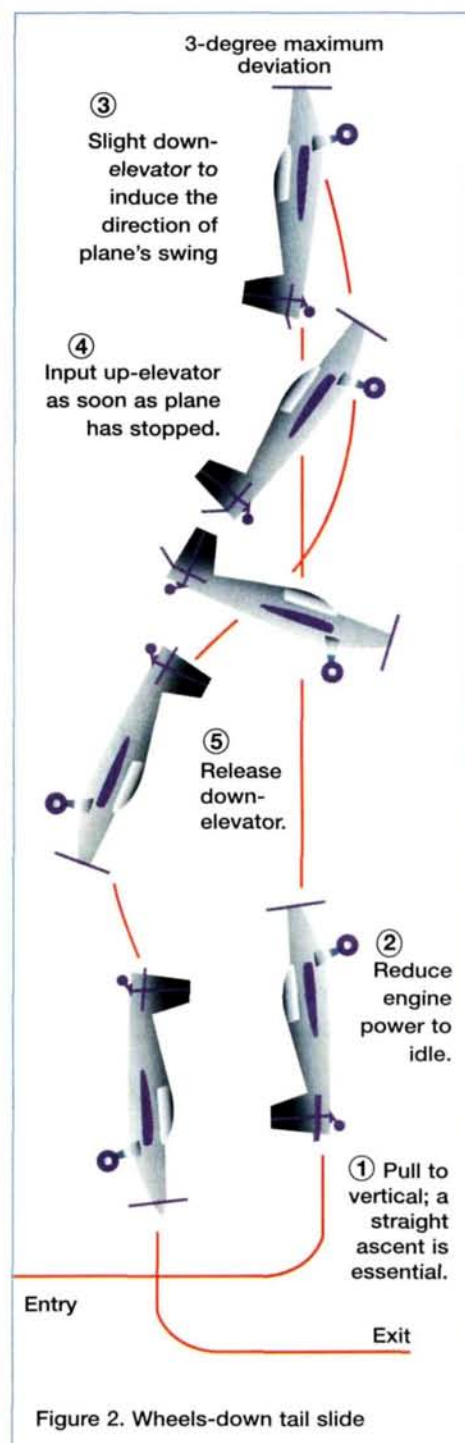
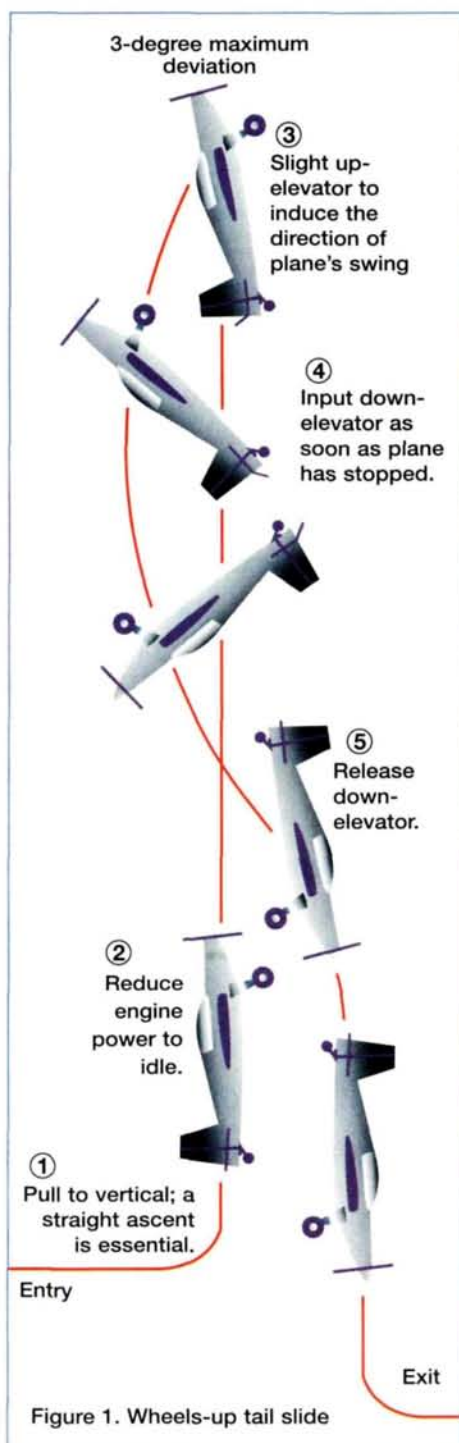


**T**he tail slide is an advanced maneuver in which the plane is flown vertically and allowed to stop. It then slides backward about one fuselage length, swings around its pitch axis, swaps ends and begins to fall nose down, regaining sufficient airspeed to enter the next maneuver.

There are two basic types of tail slides: wheels up and wheels down. During a wheels-up tail slide, the plane is allowed to pitch backward toward the canopy as it descends. During a wheels-down tail slide, the plane pitches forward toward the wheels.

## PERFORMING THE TAIL SLIDE

The most important part of a tail slide is the entry. To achieve a tail slide, a true vertical entry is required before the reduction of throttle; otherwise, the plane will slip into a hammerhead, resulting in a zero score for the maneuver in International Miniature Aerobatic Club competition



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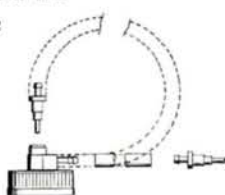
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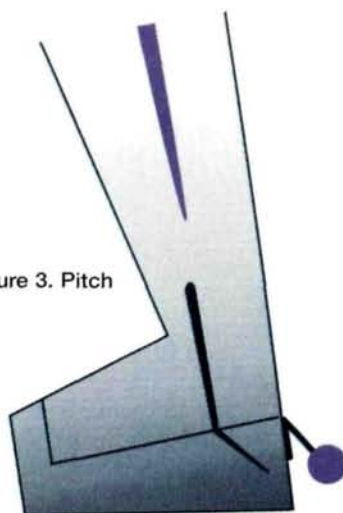


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## IMAC AEROBATICS: PERFORMING TAIL SLIDES

Figure 3. Pitch

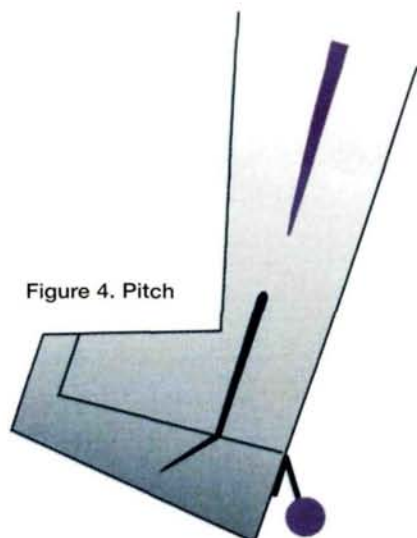


Relative wind  
as plane falls  
backward



Position of elevator as plane falls  
backward for a wheels-up tail slide

Figure 4. Pitch



Relative wind  
as plane falls  
backward



Position of elevator as plane falls  
backward for a wheels-down tail slide

(IMAC). To perform a wheels-up tail slide (Figure 1), fly to the end of the box and increase to full throttle as you pull to vertical (it's easier to look at the top of your plane during this maneuver). Quickly reduce the throttle to idle, and just before the plane stops its vertical ascent, input a small amount of up-elevator. This "cheat" will induce the plane to fall on its back side and perform a wheels-up tail slide. Keep in mind that this "cheat" requires only about 3 degrees of pitch change but is necessary to establish the desired direction of fall. Once the plane has stopped and begins its backward slip, input down-elevator. The down-elevator maintains the direction of fall during the slide. This may seem contradictory, but since the direction of the plane has reversed, so must the elevator input. Figures 3 and 4 demonstrate why opposite elevator direction is necessary during the fall. Allow the plane to "pendulum" back and forth until a straight down-line is achieved. The pendulum action about the pitch axis is not a downgrade, so don't worry about trying to stop it.

A wheels-down tail slide (Figure 2) is performed with the same entry as before, but as the upward travel stops, you input down-elevator. As the plane begins to slide backward, up-elevator is applied; this maintains the plane's pivot toward its wheels.

## PILOT'S-OPTION TAIL SLIDE

A more popular trend in model aerobatics competition during recent years is the pilot's-option tail slide. This was designed to get pilots away from "cheat" entries by allowing either a wheels-up or -down descent; this also creates a more dramatic slide. This trend seems to be catching on with IMAC, TOC, the Masters and the Pacific Coast Championship (a new, high-profile invitational event). This option seems to be the most popular with the crowd and the pilots and will probably eliminate the need for specific directional slides in the future.

## FINAL TIPS

Try not to draw a very tall up-line as you enter the tail slide. As your plane slows because of gravity and drag, you may experience a bit of torque from the prop. This will ruin your vertical up-line and could earn you a zero score. Maintain full throttle and keep the plane's speed up; then chop the throttle to idle while you still have a lot of vertical momentum. This should greatly reduce the torque induced by the prop.

Have fun with the tail slide. Compete with your flying buddies by counting how long you can get it to slide backward. For added fun, try it with smoke. The dramatic effect of your plane falling through a dense cloud of smoke is a definite crowd-pleaser! ★



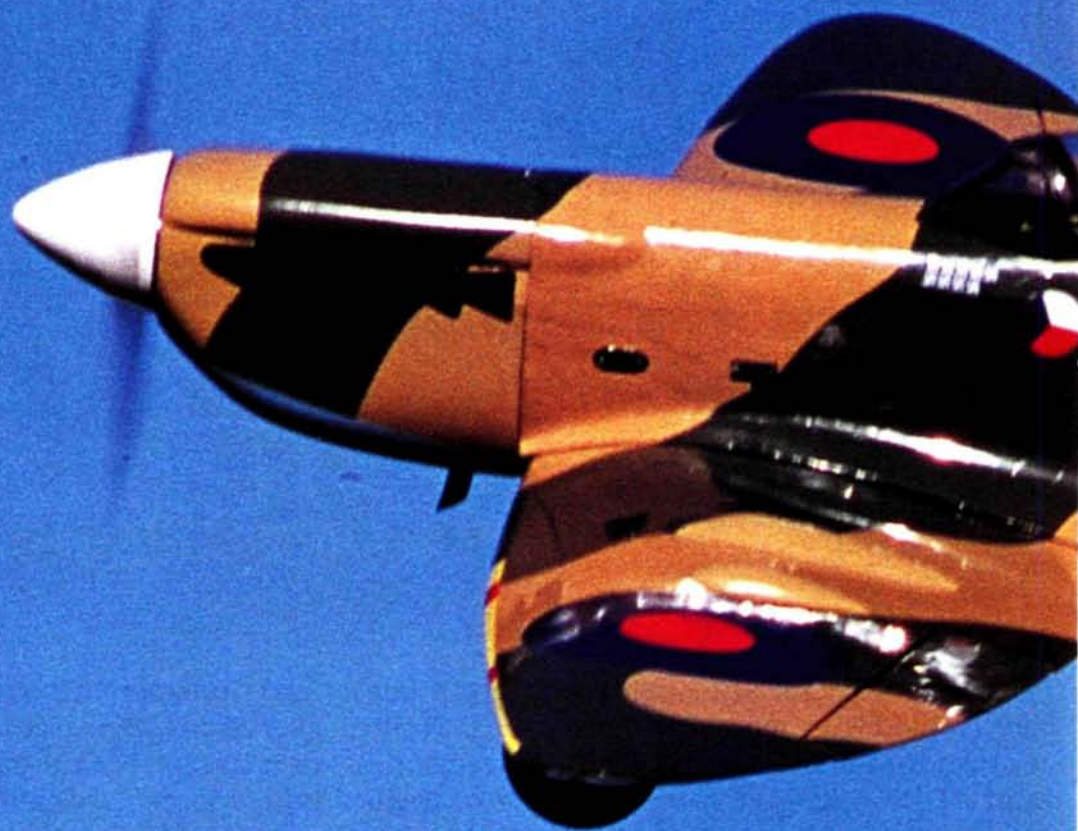
by Jim Onorato

TOP FLITE

# Spitfire Mk

**B**ritain's Spitfire Mk. IX was developed specifically to counter the Luftwaffe's Focke Wulf and is considered by some to be the finest Spitfire of all. When the plane entered operational service in July 1942, it had more power and fuel capacity than any previous Spitfire variant. With a total production of 5,665 aircraft, the Mk. IX exceeded Britain's expectations. As history shows, the fighter surprised many of Germany's top pilots and was instrumental in turning the tide of WW II.

Top Flite's\* .60- to .75-size, Gold Edition Spitfire is a fine re-creation of this historic warbird. Several modifications have been made to improve ground handling and flying stability, but the 1/2-scale kit qualifies for fun-scale and sport-scale competition.



# X Gold Edition

Re-creating a WW II legend



## SPECIFICATIONS

**Model:** Spitfire Mk. IX

**Manufacturer:** Top Flite Models

**Type:** 1/2 sport-scale

**Wingspan:** 63 in.

**Wing area:** 687 sq. in.

**Weight:** 10.5 lb.

**Wing loading:** 35.2 oz./sq. ft.

**Length:** 53 in.

**Radio req'd:** 4- to 6-channel with 5 to 7 servos

**Engine req'd:** .61 to .75 2-stroke; .70 to .91 4-stroke

**Engine used:** SuperTigre .75G

**Street price:** \$149.95

**Features:** fully sheeted balsa and lite-ply construction with basswood wing spars. Kit has provisions for installation of split flaps

and retracts. Kit includes hinges, adjustable engine mount, preformed landing gear, self-adhesive decals, ABS cowl, vacuum-formed canopy and a generous hardware package.

**Comments:** the Top Flite Gold Edition Spitfire Mk. IX is a high-quality, sport-scale kit that looks great on the ground and in the air. Though not the easiest kit to build, this model offers a great deal of satisfaction to a patient builder with average building skills. The end result is certainly worth the effort!

### Hits

- Great scale appearance.
- High-quality materials and die-cutting.
- Excellent, step-by-step instruction manual with photos.

### Misses

- Labeling errors on parts and instructions.
- Wing and stab sheeting extremely fragile.
- High wing loading.

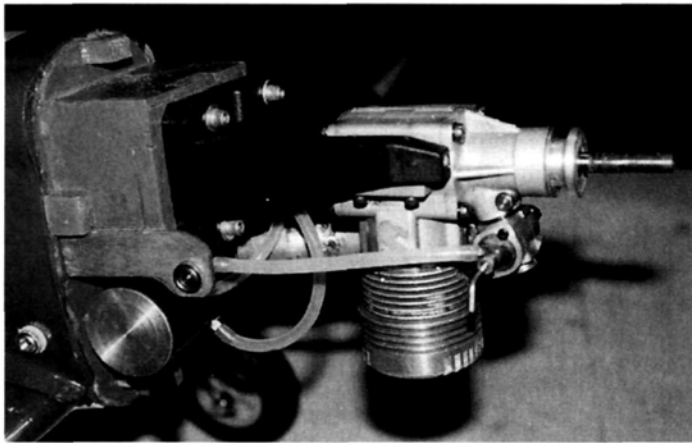


PHOTOS BY WALTER SIDAS

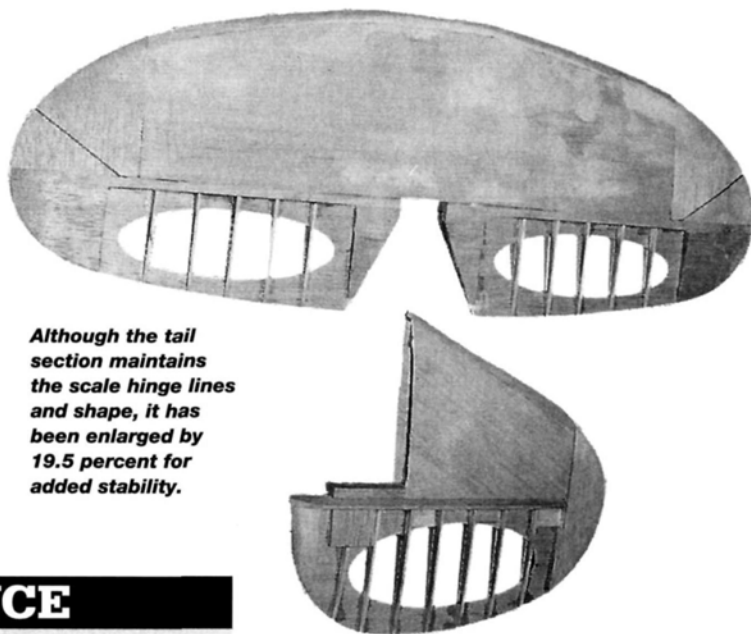
*To enhance the look of your Spitfire, Top Flite offers scale accessories such as this scale pilot and interior.*

## THE KIT

The kit features balsa and lite-ply construction with basswood wing spars and includes hinges, an adjustable engine mount, preformed landing gear, adhesive decals, ABS cowl, a vacuum-formed canopy and a generous hardware package. Two sheets of rolled plans and an excellent 64-page instruction manual are also included. This is a typical Top Flite Gold Edition kit with the high-quality materials and excellent parts fit that modelers have come to expect. Top Flite also offers several optional scale accessories to enhance the appearance of the Spitfire; these include a scale cockpit interior and full-body pilot figure.



On the business end of the Spitfire, the SuperTigre 75G and Soundmaster muffler fit comfortably inside the cowl.



Although the tail section maintains the scale hinge lines and shape, it has been enlarged by 19.5 percent for added stability.

## FLIGHT PERFORMANCE

First flights are usually a little nerve-racking, but I must say that I was more than a little apprehensive when I went out for the Spitfire's first flight. All I could think of was that high (35 ounces per square foot) wing loading. Fortunately, it didn't turn out to be a major problem.

### • TAKEOFF AND LANDING

I advanced the throttle slowly while holding a bit of up-elevator to keep the tail down until the Spit was rolling. I then relaxed the elevator to allow the tail to come up and the plane to gain speed. Little or no rudder input was necessary to keep it tracking straight ahead. When I was certain the Spitfire had reached flying speed, I applied just a touch of up-elevator, and the Spitfire rose smoothly into the air with almost no rotation. The mellow sound of the Soundmaster muffler and the sight of that unique elliptical wing as the Spitfire went into a shallow, climbing right turn made my day!

Almost all of my landings have been wheel landings at moderate speed. Because the Spitfire is rather heavy, I always try to bring it in under power, and I don't chop the throttle until touchdown. The approach is usually very steady with the wing perfectly level; although the split flaps don't seem to slow the Spit very much, they certainly look great!

### • LOW-SPEED PERFORMANCE

I really can't say a lot about slow-speed perfor-

mance because I tend to fly the Spitfire like the warbird that it is—fast! However, I will say that the Spit was solid and controllable throughout all of my flights. This plane really isn't meant to fly slowly.

### • HIGH-SPEED PERFORMANCE

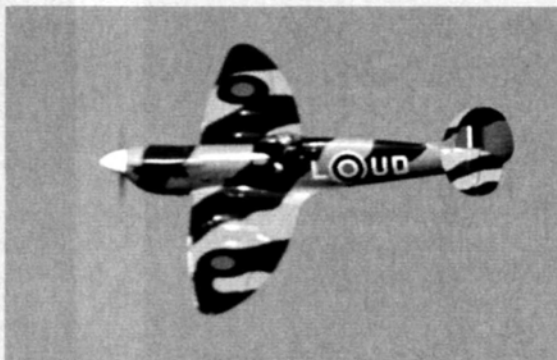
The SuperTigre .75 was a good choice for the Spitfire, as it hauls the plane through the sky at scale speed. Tracking is excellent, and the plane is quite stable at full throttle. Retracts really clean up a plane in flight, and high-speed, low passes with the wheels up are a sight to behold.

### • AEROBATICS

This Spitfire is intended for scale and general sport flying and is capable of mild aerobatics such as loops, stall turns, rolls, etc. I did not ask it to do more.

### • CONCLUSION

This is a nice flying sport-scale warbird with good scale appearance. If you are not already in love with Spitfires, this one could make a convert out of you.



## CONSTRUCTION

I had to make a few decisions before I started construction. Top Flite recommends a .60 to .75 2-stroke or .70 to .91 4-stroke. I opted for a SuperTigre\* .75G 2-stroke. Next, I had to decide between fixed or retractable landing gear. The Spit is designed to accept Robart\* no. 605 90-degree, heavy-duty pneumatic retracts. You can use other retracts, but that would require making any necessary modifications. I went with the Robart. I also wanted to incorporate scale split flaps. The plans and instructions cover all of these options in detail.

I used Great Planes\* Pro CAs and Pro Epoxy for most of the construction and Top Flite MonoKote\* film and LustreKote\* paint for finishing.

## TAIL FEATHERS

Although the fin and stab retain an accurate hinge line, the entire empennage has been enlarged by 19.5 percent to give the model a solid feel in the air and enhance stability. The tail feathers have symmetrical airfoils with sheeted stab and fin, which are built directly over the plan. Neither the stab nor the fin have spars. Instead, the stab ribs, which have jig tabs, are pinned to the building board, and then a center core is glued into notches at the front of the ribs. After I attached the leading and trailing edges, I sheeted the top of the stab with 1/16-inch balsa. (The 1/16-inch sheet balsa in my kit was extremely soft and fragile. This was frustrating because I accidentally put my fingers through the sheeting on more than one occasion.) I removed the stab from the building board, took off the jig tabs and installed the hinge blocks. Then I sheeted the stab and built the fin in a similar fashion.

The elevator and rudder are not built over the plan but are made by gluing ribs

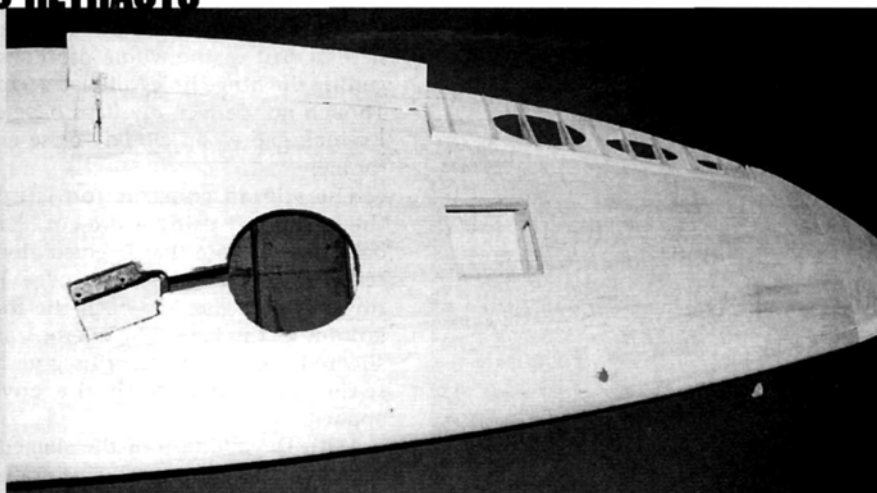
# ROBART HEAVY-DUTY PNEUMATIC RETRACTS

The Top Flite Spitfire is designed for Robart's no. 605 heavy-duty 90-degree pneumatic retracts. The gear weighs approximately 5 ounces and features  $\frac{3}{16}$ -inch tempered-steel legs with positive up- and down-locks made of tough nylon. The straight legs are cut to length, and then a bolt-on axle is attached.

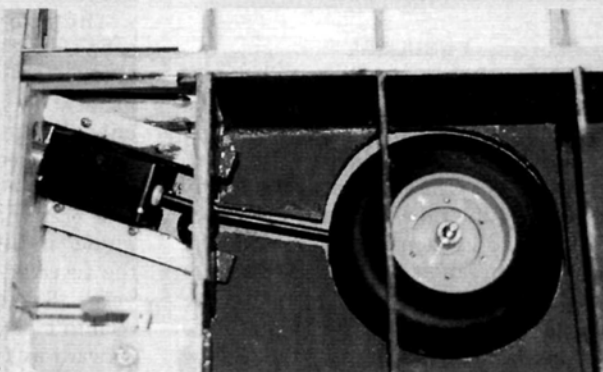
To fit into the wing properly, the retracts have to be disassembled and the air cylinders mounted so that they are opposite the legs. This requires the use of two small bushings that are available from Robart for two bucks. To give the wheel more clearance in the wheel well, the right and left struts are swapped during reassembly.

I used a Robart Deluxe Air Control Kit (no. 188VRX) to operate the retracts; it includes the air-fill valve and chuck, T-fittings, variable-control valve, tubing, retaining nuts, air tank, quick disconnects and an onboard pressure gauge. The only additional items needed are a servo to operate the air-control valve and a hand pump. I did not use the onboard pressure gauge because space was somewhat limited in the Spitfire fuselage. The variable-control valve allows you to adjust the speed at which the gear is raised and lowered, without the need for separate air restricters. I set mine to rise slowly and come down fast!

Installation of the retracts is quite simple. The plywood landing-gear rails for the retracts are installed during the construction of the outer panels. The rails fit into die-cut notches in the ribs so that the wheels will be at the correct



*After the Robart retracts had been fitted into the Spitfire, I coated the wheel wells with flat zinc chromate green.*

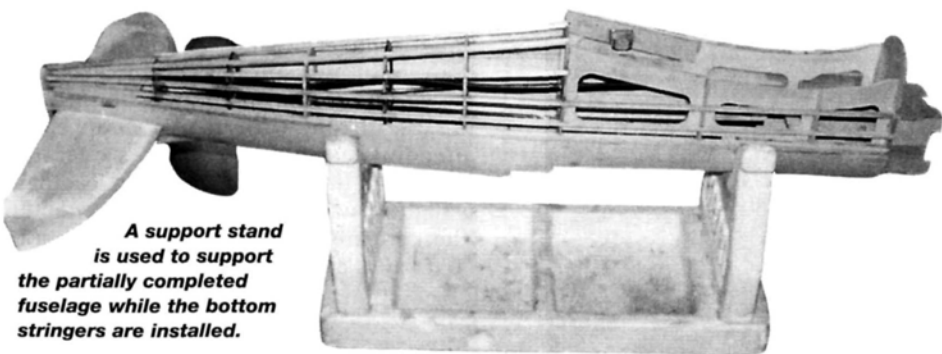


*When the retracts are in place, the wheel wells are final-shaped into the lower sheeting.*

angle and position when the gear is extended. The retracts are attached to the rails with four screws. As in the full-size Spitfire, the landing gear pivot outward toward the wingtips. The most critical step in the installation is to make sure that the legs are positioned with the coil parallel to the ribs and that the axle is parallel to the spars when in the down position. After I had done this, I filed a "flat" on the leg so it wouldn't rotate.

When I first installed my retracts, the wheels splayed outward too much; to reduce the angle, I installed a washer under the outboard mounting screws.

The retracts worked perfectly at the field. On one occasion, the engine quit as I was setting up for a low pass. With the plane only 5 feet off the ground at the time, a quick flip of the retract switch had the gear down and locked quickly—just in time for a pretty wheel landing. That kind of reliability surely builds confidence!



*A support stand is used to support the partially completed fuselage while the bottom stringers are installed.*

## WING

The Spitfire's elliptical wing is, by far, its most distinguishing feature. Since I had decided to go with split flaps and retractable landing gear, I knew the wing would also be the most complex and time-consuming part of this project. Fifteen pages of the instruction manual are

devoted to the wing. The construction isn't particularly difficult; there's just a lot of it.

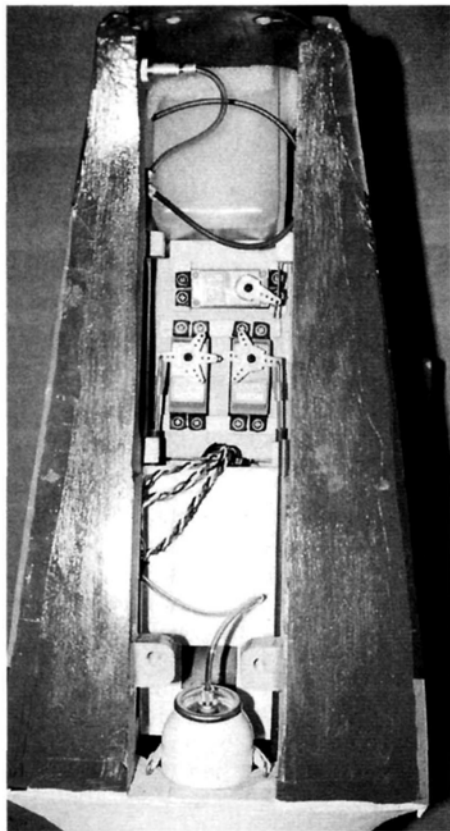
The wing, which is fully sheeted with  $\frac{1}{16}$ -inch balsa, has a Selig airfoil and is built directly over the plan in three pieces: the conventional framework construction consists of die-cut balsa ribs with jig tabs, two basswood spars and balsa shear webs. Plywood landing-gear rails for the retracts are installed during construction of the outer panels. Die-cut notches in the ribs allow the rails to go in at an angle to ensure that the wheels will be in the correct position when the landing gear is down.

During construction, I found that the labeling of the forward and aft dowel plates was reversed on the die-cut sheets. The forward plates are the narrow ones, and the aft plates are the wide ones.

After I sheeted the top of the center

## SPITFIRE

*When the radio gear, retract air reservoir and fuel tank have been installed, the fuselage is a bit cramped.*



section, I removed it from the building board and temporarily installed the flap servo and pushrod. The outer panels are joined to the center section while the wing is upside-down. A couple of unique plywood jigs are provided to keep the whole assembly straight and ensure the proper amount of dihedral. This worked out really well.

At this point, I trial-fit the retracts into the wings, installed the flap bellcranks and servo-hatch rails and prepared the framework for sheeting. The outer wing panels use 16 sheets of  $\frac{1}{8} \times 3 \times 36$  balsa. I sheeted the bottom of the wing and cut holes for the retracts and aileron servo hatches. The aileron servos are attached directly to the hatches and then held in place with six flat-head wood screws. This is a neat installation. The top of the wing is sheeted while it is cradled in another set of jigs. Even though this was my first attempt at making split flaps, the detailed instructions made things fairly easy. There are four,  $\frac{1}{8}$ -inch, die-cut plywood flap skins; two are glued to the wing's top sheeting, and the bottom two are attached with

four pivot-point hinges in each flap. The hardest part of the whole procedure was getting the hinge holes aligned accurately. Though not perfect, my flaps have only a  $\frac{1}{32}$ -inch gap when closed—close enough for me!

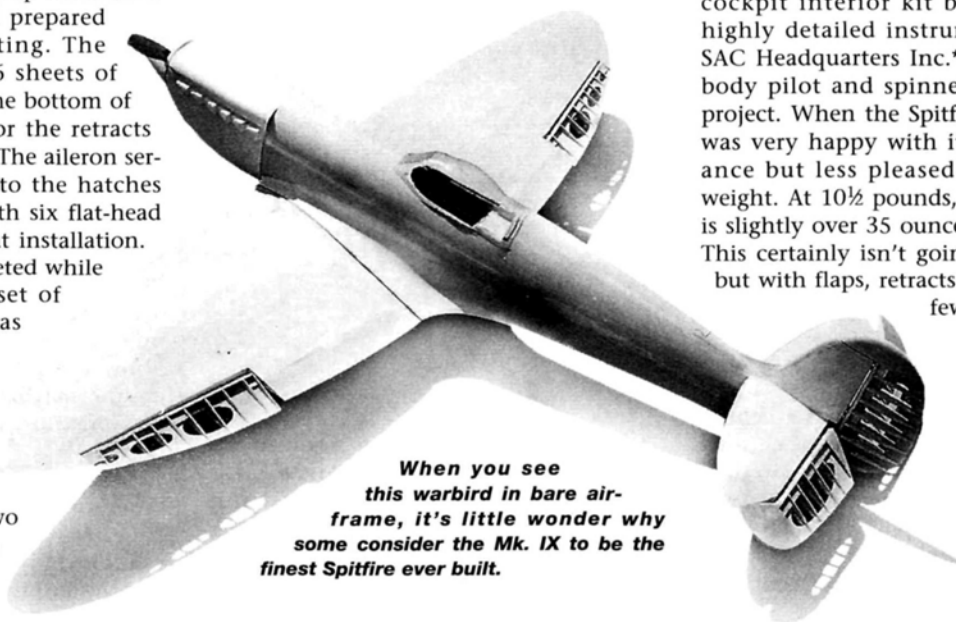
The aileron construction is unique; they are built using a die-cut,  $\frac{3}{32}$ -inch balsa aileron base that is glued along the center of the aileron leading edge. Eleven ribs are then glued to both the top and bottom of the base. The ailerons are not sheeted, and the extra ribs give a nice scale appearance with the covering applied.

With the addition of the shaped leading edge and laminated tip blocks, the wing was complete. There's no mistaking that beautiful elliptical shape! I built two radiators and set them aside.

### FUSELAGE

The sequence of fuselage construction is quite unconventional. The top half of the fuselage is built over the plan by installing die-cut formers and stringers over two main stringers. The fuselage is then fully sheeted, and the fin and stab are installed. The fuselage is then removed from the building board and placed upside-down in a support stand (not provided) while the bottom formers and stringers are attached. Be careful not to introduce any twist into the structure while sheeting the bottom of the unsupported fuselage.

There were several errors in the fuselage section: some of the parts were mislabeled, references to parts in the instructions were incorrect, and more than one part had the same number as another one. None of these were of major consequence; they were just annoying. (Great Planes is aware of these errors and will correct future production runs.)



*When you see this warbird in bare air-frame, it's little wonder why some consider the Mk. IX to be the finest Spitfire ever built.*

I attached the molded-plastic wing fillets to their die-cut,  $\frac{1}{8}$ -inch plywood bases after the wing had been fitted to the fuselage. This task went very smoothly, and the large fillets really say "Spitfire"!

### FINAL STEPS

I installed my SuperTigre .75 and Top Flite's optional header and in-cowl muffler in the inverted position using the provided adjustable engine mount. I later discovered that the Top Flite muffler was not very effective (over 100dB at 9 feet), so I substituted a Davis Model Products\* Soundmaster muffler to get the sound down to an acceptable level (less than 96dB at 9 feet). This muffler has almost the same dimensions and configuration as the Top Flite, so it fit entirely within the cowl.

The two-piece ABS cowl has scale exhaust stacks molded into its sides. After I attached the cowl using four no. 4 sheet-metal screws, I found that the molded aft cowl blisters did not fit properly; I replaced them with carved balsa ones.

I installed the radio components on two trays: an upper for the throttle, rudder and elevator servos and a lower for the receiver, retract servo and retract air valve. Because of this configuration, I couldn't place the receiver battery as far forward as I would have liked. With the pack under the fuel tank immediately behind former F1, the Spit required about 8 ounces of nose weight to balance.

### FINISHING

I used tan, olive drab and sky blue MonoKote and matching LustreKote spray to finish the Spit and then applied the decals provided with the kit. I painted the insides of the wheel wells and the inside surfaces of the split flaps with flat zinc chromate green. I installed the Top Flite cockpit interior kit but substituted a highly detailed instrument panel from SAC Headquarters Inc.\* A Top Flite full-body pilot and spinner completed this project. When the Spitfire was finished, I was very happy with its overall appearance but less pleased with its overall weight. At 10½ pounds, the wing loading is slightly over 35 ounces per square foot! This certainly isn't going to be a floater, but with flaps, retracts and seven servos, few warbirds are.

\*Addresses are listed alphabetically in the Index of Manufacturers on page 134. ✦



THE

## IKARUS PICCOLO

**MODEL AIRPLANE NEWS**  
**FIELD & BENCH**  
**REVIEW**

I first saw the Ikarus\* Piccolo fly at the WRAM show in New York in February '99. I was hooked the minute I laid eyes on it, but the hook was "set" during its demonstration flight. This model had only a 10-foot-diameter space to fly in, and it locked into the center of this space with a quality of flight that was a tribute to the model and to the pilot.

You will need the Ikarus Piccboard (approximately \$190). This is the electronics package that includes the receiver, twin speed controls (tail and main rotor), piezo gyro and throttle-yaw mixer. Price the individual components, then weigh them; you will decide to buy the Piccboard. It's well worth it!

#### FIRST IMPRESSIONS

The model comes in a nifty carrying case that holds the finished model when it's completed. My first impressions were a mixture of shock and awe at how few parts there are! Most of the frame parts are made of carbon rod. This material is as tough as it can be yet is still ultra light. The rotor blades are nylon and, so far, they have been very tough. (I have tested their toughness thoroughly!)



#### INSTRUCTIONS

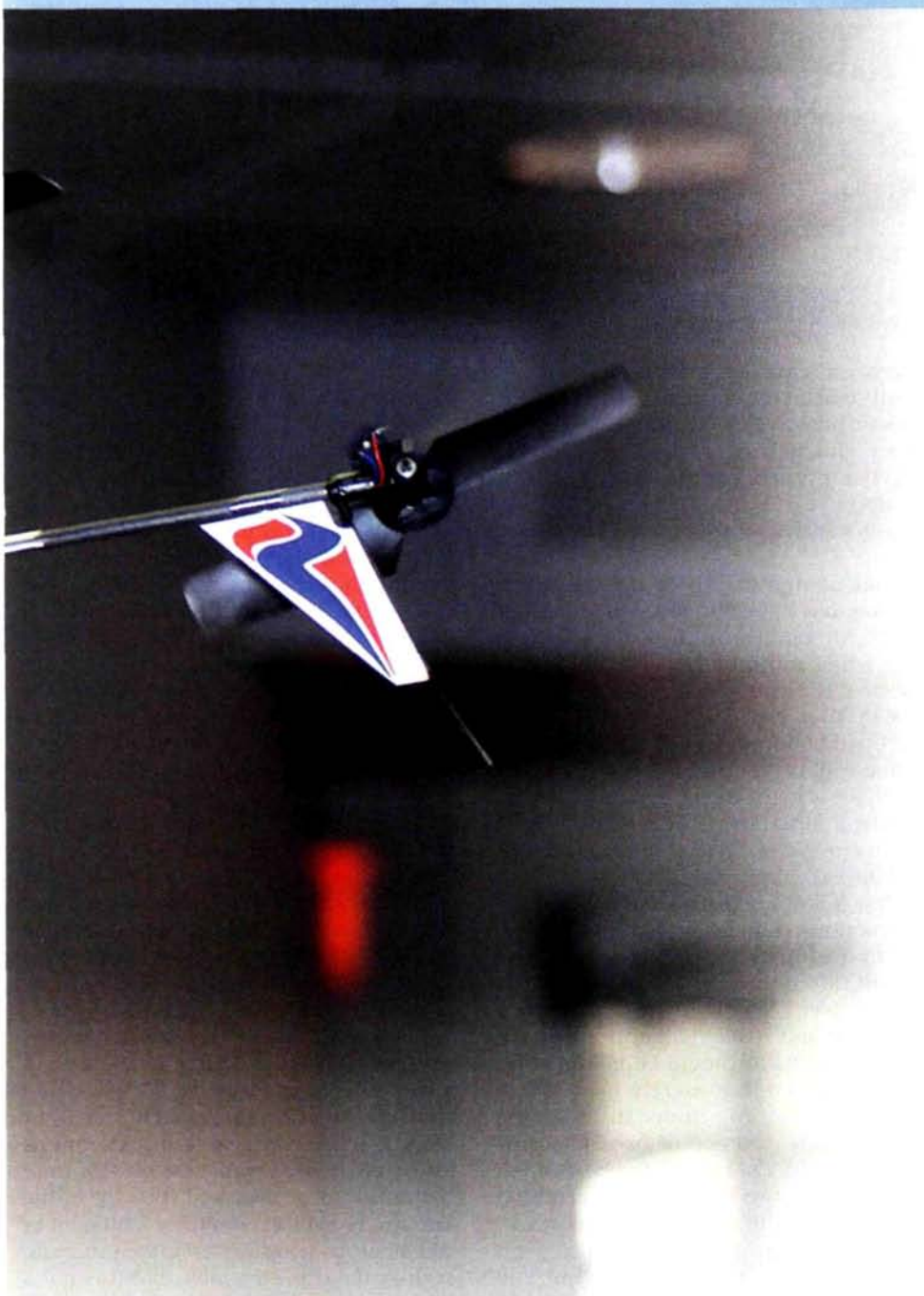
The first instructions I received were in German, so I called the manufacturer and asked them to send me an English translation. The English instructions were text only, though, so I had to follow along with the German manual because it had all the diagrams and pictures! I had no problem assembling the model, but I understand from the importer, R/C Direct, that the complete English instructions should be ready shortly.

My favorite line in the instructions was: "Every gram of additional weight on this helicopter will cost you approximately 5 seconds of flight time." I took this as a personal threat and changed the applicator tip on my glue bottle to the finest one I could get!

Much of the instructions appears to be aimed at newcomers. This surprised me, as I had not previously considered this to be a beginner's model. Now that mine is trimmed well, I must say that it is a very easy heli to fly, and once properly set up and trimmed, it could be used as a first heli. I recommend that anyone who is contemplating this as a first heli model seek the assistance of an experienced heli modeler who can check the linkages and setup and trim the model for ultimate success.

A note of caution: try to have all of the moving components working very freely. Following is a list of the areas that I went back over that changed my heli into a super-stable machine. Use great care not to create slop when you are trying to fix a binding linkage or joint, such as:

*Indoor flying at its best!*



**Left:** the nylon tail rotor is powered by a small, gear-driven motor that has its own speed control.

**Right:** here, with the canopy removed, you have a clear view of the rotorhead, control servo, drive motor and the Piccoboard (the rectangular object). The Piccoboard performs as a receiver, gyro and speed control for two motors.



## SPECIFICATIONS

**Model name:** Piccolo

**Manufacturer:** Ikarus (Germany)

**Importer:** R/C Direct

**Type:** electric helicopter

**Rotor diameter:** 20.5 in.

**Length:** 19 in.

**Weight:** 7.53 oz. w/3-cell Tadiran pack

**Radio req'd:** 4-channel (w/use of Piccoboard)

**Radio used:** JR 8103

**Price:** \$199.99 (plus \$189 for Piccoboard)

**Features:** durable carbon-rod construction with nylon rotor blades, separate tail-drive motor with spur and pinion-gear drive used for yaw control.

**Comments:** the Piccolo is an easy-to-fly electric helicopter that is suitable for indoor use; properly trimmed, it is also suitable for beginners. It's lightweight with dual-motor drives, and emerging battery technology offers flight times that exceed traditional glow machines.

### Hits

- Long flight times.
- Durable construction.
- Usable indoors.
- Requires only a 4-channel radio.

### Misses

- Directions could be clearer.



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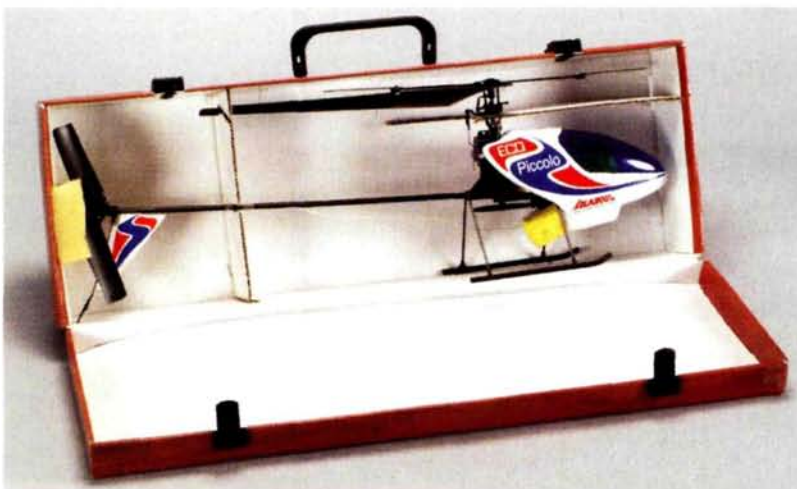
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or call for more information

**901-755-1536**

Dealers inquiries invited.

## THE IKARUS PICCOLO



The  
Piccolo  
fits inside  
this card-  
board carry-  
ing case  
(supplied)  
for trans-  
port.

- servo arms to cyclic pushrod.
- ball joints. (The instructions are explicit about how to loosen these; follow them very carefully.)
- flybar pivoting motion and seesaw motion.
- mesh of gears.

Because of an oversight on my part, I had nothing but difficulty during my first test flight. My problem turned out to be the way I had mounted the Piccboard. I reviewed the instructions to see what I had missed. They state:

"Installation of the Piccboard: first, connect all of the components except for the flight battery. Then install the board to the shelf on the frame such that the leads face the rear, the crystal is oriented upward and the LED is oriented to the left."

Here is how I managed not to follow the instructions. Whenever I mount a gyro, my first priority is the integrity of the mount. Mounting the Piccboard on its flat receiver (PC) board side made for a very solid and stable mount, but this was wrong; the board should be mounted on its side. The side is merely heat-shrink wrap with nothing under it. Since the Piccboard is made up of two PC boards that are not the same size, the heat-shrink that holds the two boards together ends up on an angle with no support beneath it. The instructions do not tell you to shim the Piccboard until it is level, but you must. If you don't, you will get roll and yaw mixed into the signal to the tail rotor.

The instructions' reference to the LED being oriented to the left should instead read, "... facing to the left." I was satisfied that I could see the LED from the left side of the machine.

Although the mounting error was mine, I recommend that Ikarus label the gyro with a sticker that has both an arrow and the word "up" in as many languages as it takes to satisfy its customers. It would eliminate any problems with the orientation of the gyro.

### FLIGHT

As I have already stated, this machine is stable enough to be used as a trainer. It is very smooth and not very difficult to balance. Probably the biggest difference between how it flies versus how a larger gas machine flies has mostly to do with its light weight. It has only 8.5 ounces of weight that it can use toward inertia. Inducing and stopping forward motion takes a different proportion of stick movement than we are used to.

I have let a variety of heli fliers try the Piccolo, and they all agree that it is easy to fly. Most tend to over-control at first, but I have found that patience is the best approach to practicing flying this machine. If you are hovering and want to move forward, move the cyclic stick forward only a small amount and wait. It will start to move, but not spontaneously. If you over-control, it will eventually overreact. We are not dealing with minutes here but just about half a second's delay—for some fliers, enough to deflect the stick a little too far.

The Piccolo is at its coolest when it hovers inside. There is less turbulence than you would expect, and again, I've found that this is due to the machine's light weight. It doesn't have to displace much air to lift itself! I now take off from my desk, land on a chair and then fly to the kitchen in comfort. You'll see a little bit of turbulence as you fly over uneven surfaces, such as the edge of a table, but it is not a problem if you transition through it. As with all models, get accustomed to the Piccolo in adequate open space and don't try to tour the house until you've become used to its reaction time.

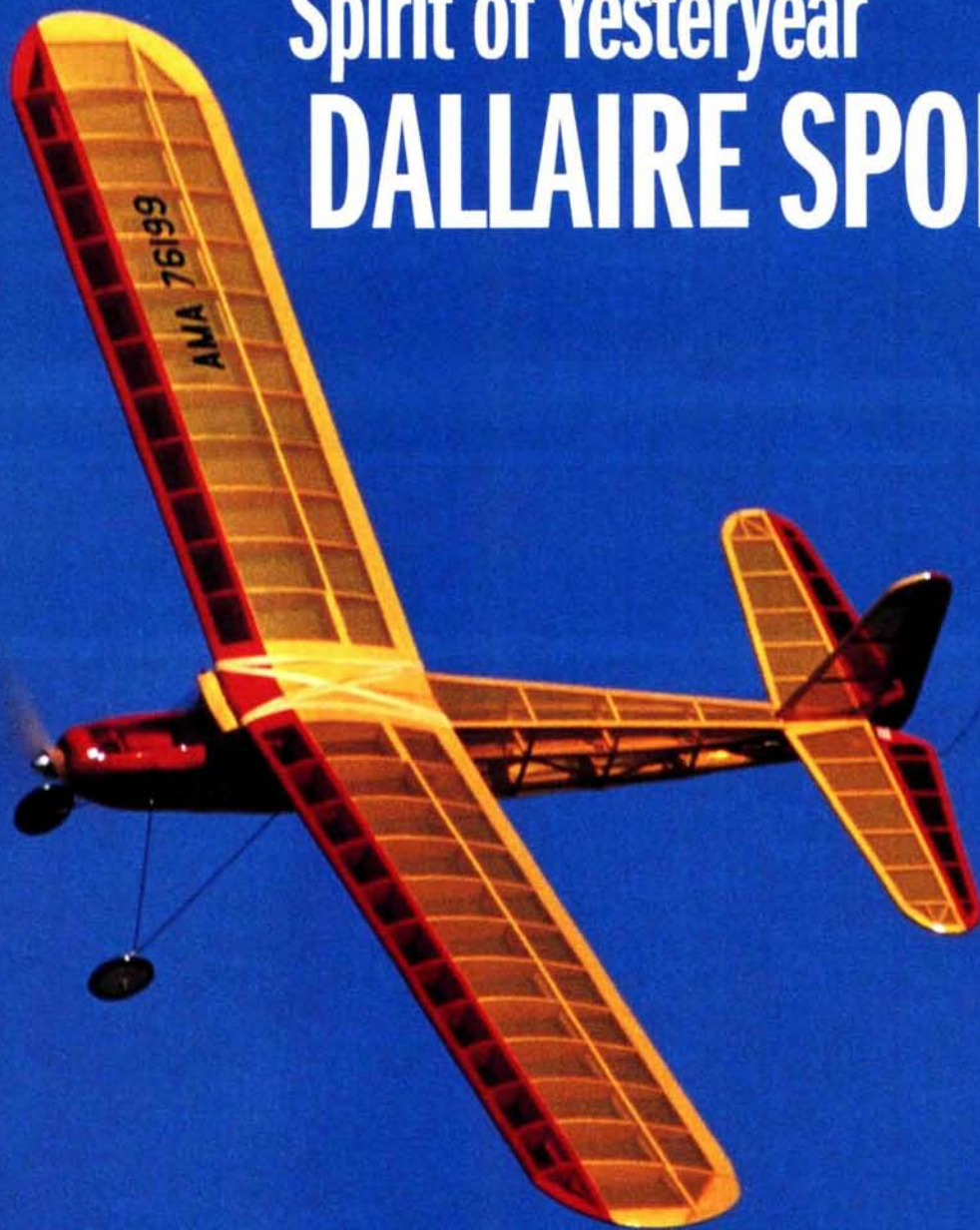
### BATTERY SELECTION

With eight Sanyo 225AE cells, I got about 5 minutes of flight, with great performance throughout. When I switched to a 3-cell, 800mAh Tadiran pack from Northeast Sailplane Products,\* the Piccolo was 1 ounce lighter, and duration increased to 27 minutes!

I love this little heli. ✈

by Greg Gimlick

# Spirit of Yesteryear DALLAIRE SPORTSTER



**W**hen folks talk about "old-timers," I often don't know whether they mean my peer group in modeling or the classic models of the past! In this case, however, I'm talking about the Dallaire Sportster: a Spirit of Yesteryear® RC offering that was originally a 1937 free-flight model. If you remember those days, you probably recall getting the plans and carefully selecting the balsa, but today, we're spoiled by companies such as Spirit of Yesteryear that select premium balsa and laser-cut the pieces so they fit better than if we had cut them by hand. The Dallaire Sportster is designed for either 1/2A glow

or electric power and comes with firewalls to support either. I chose the electric version, but whichever you prefer, you won't be disappointed with this kit.

If you've never built a stick-and-tissue plane, building the Sportster will open up a new world of design and construction for you. Everything comes neatly packaged and grouped in a sturdy box that protects the parts from shipping damage.



*A classic design goes RC*

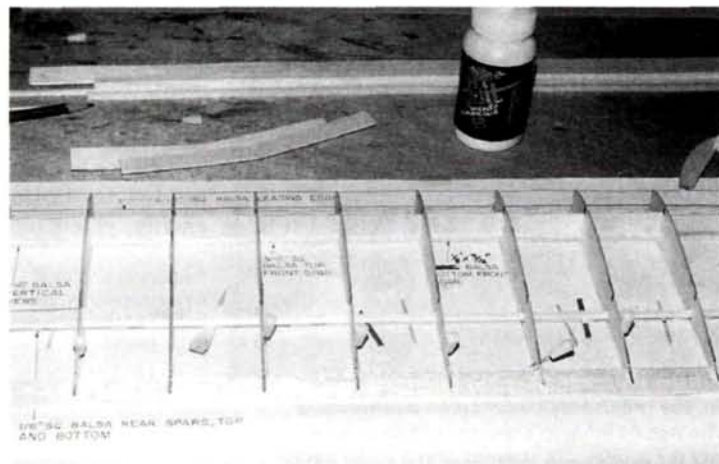
## FUSELAGE CONSTRUCTION

This is where it all begins. The pieces are mostly made up of  $\frac{1}{16}$ - and  $\frac{1}{8}$ -inch sticks that you cut to length as you build. Sizes are clearly marked on the plans, and all you'll need is a razor blade and some sandpaper. There are a lot of angles to cut as you fit the stringers, so take your time and work carefully over the plans to be sure you make matching sides. If you decide to use transparent covering to show off your woodworking skills, take extra time to make the joints fit perfectly; they'll look better and be sturdier. Construction is straightforward. One of the nice things Spirit of Yesteryear has done is to supply pre-cut gussets and doublers, so look at them carefully before you use them; some are cut for 90-degree joints, and a few are cut at 92 degrees. That doesn't sound like much of a difference, but if you try to use the wrong one, you'll know it at once. Be sure you use the dihedral braces as a guide when you set the top fuselage gussets in place so that the wing will be seated properly. The only problem I ran into during construction occurred when I was a bit heavy-handed; I broke some of the  $\frac{1}{16}$ -inch stringers as I was handling the completed fuselage, so be careful.

You'll also have to make some decisions when you build the nose of the fuselage, depending on the power source that you select. Spirit of Yesterday provides a firewall for a Texaco engine and one that will fit a direct-drive Speed 400 motor. I used a geared motor and had to build my own mount, but there is plenty of room to work in, and it was easily accomplished.

## WING AND TAIL CONSTRUCTION

The wing halves are built directly over the plans and joined to form the dihedral angle. All of the ribs and wingtip pieces are laser-cut and clearly identifiable on their carrier sheets. All of the parts were easy to remove from the sheets, and the consistency of the balsa was excellent. The wing design incorporates an I-beam main



To properly meet the undercambered ribs, the rear wing spar is shimmed.

spar that is easy to build because of the pre-cut shear webs. The shear webs are placed as you use them to space the ribs, and it's recommended in the instructions that you use white glue instead of CA because of its flexibility. I used Pica\* Glue throughout most of the kit and found that it dried almost as quickly as CA and was much easier to sand. Wing construction proceeds quickly, and as long as you pay attention to the plans and instructions, it should present no problems. Be sure to use scrap balsa to support the lower aft spar because of the undercambered airfoil; if you don't, you'll end up with a spar that is not fully seated into the ribs.

All of the tail assembly is built flat on the plan out of pre-cut pieces and square stringers. The elevator halves are

## SPECIFICATIONS

**Model name:** Dallaire Sportster  
**Manufacturer:** Spirit of Yesteryear  
**Type:** old-timer  
**Wingspan:** 52 in.  
**Wing area:** 340 sq. in.  
**Wing loading:** 9 oz./sq. ft.  
**Length:** 29 in.  
**Weight:** 21 oz.  
**Power recommended:**  $\frac{1}{2}$ A engine or direct-drive Speed 400 motor  
**Power used:** Modelair-Tech MGB-50 motor/gearbox, 8 cells, 10x6 prop  
**Channels req'd:** 3 (throttle, elevator, rudder)  
**Radio used:** Futaba\* 8UAF, Hitec\* 535 receiver and HS-80 servos  
**List price:** \$60

**Features:** all laser-cut wood kit with complete hardware package, including mounts for glow and electric power. It comes with full-size plans, detailed instructions and parts list.

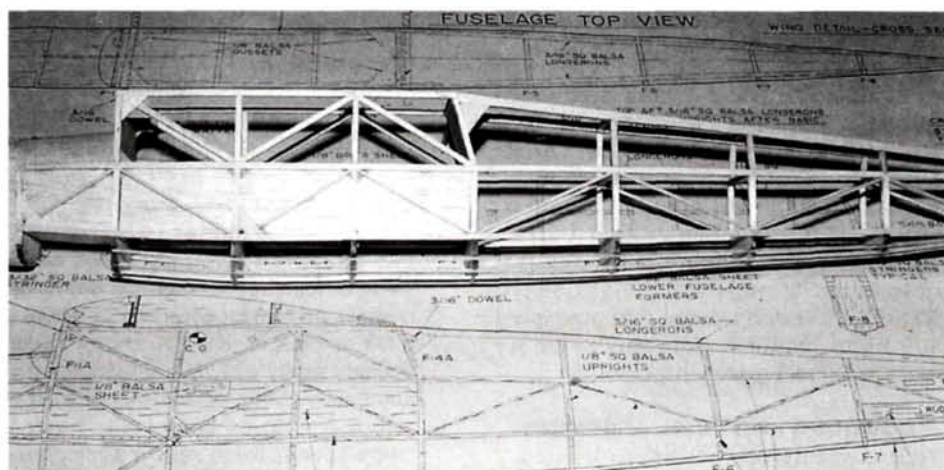
**Comments:** this is a great introduction to old-timers and light construction methods and provides an extremely relaxing flying experience. It's also a great thermal plane, so you can fly it forever on a single charge.

### Hits

- Excellent parts fit.
- Consistent wood selection.
- Good flight characteristics

### Misses

- None found.



Side view of the completed fuselage. Use care when handling it; I was clumsy and broke the bottom front stringers.

joined by  $\frac{1}{16}$ -inch wire that you will have to bend to shape. When the pieces are complete, you can sand them to shape according to the cross-section on the plan.

## LANDING GEAR AND RADIO INSTALLATION

The landing gear is made up of four, prebent pieces of music wire that you solder together. If you haven't done this before, you may find some pointers beneficial. Fortunately, I found the prebent angles were perfect; that's usually one of the hardest parts for the builder to get right. Remember to clean the wire before you solder it. I found that by using a wooden jig to hold the wire in place, I was able to do everything without worrying about damaging the fuselage while I soldered. After thoroughly cleaning the wire pieces, I placed them in the jig so I was able to wrap the provided copper wire around the joint before soldering. I used a little silver soldering kit from Great Planes\* along with a small torch. I find silver solder is not only strong but also easier to use on music wire than regular 60:40 solder, but use whatever works for you. When the gear is completed, slide it into each side of the fuselage where you built

## DALLAIRE SPORTSTER

in the small brass tubes. When I did the final assembly, I used a bit of silicone in each hole to hold the gear in place. The wheels are made of plastic halves that need to be glued together and painted.

Before you cover the model, it's best to install all of your equipment and get a feel not only for where it will fit, but also how to place it for balance. I found that by placing the receiver on a small platform above the servos, I had lots of room on the battery shelf to adjust the motor battery to get the CG where I wanted it. The downside to this arrangement is that it makes future servo adjustments more difficult, so I made the receiver shelf easily removable. The pushrods are made of square balsa and music wire. My speed control rests ahead of the battery platform and behind the motor along the side of the fuselage, out of harm's way.

If you've built it lightly and kept everything true, this plane doesn't need much to keep it in the air. I selected an MGB-50 motor/gearbox combination from Modelair-Tech\* because of its compact size and small offset through the gearbox. This 7- to 10-cell motor is geared 2.14:1 and is capable of spinning a 10x6 prop at only about 8 amps using eight Sanyo 500AR cells. I don't doubt that any Speed 400 motor could handle this 21-ounce beast as a direct-drive setup, too.

### COVERING AND FINAL ASSEMBLY

Your covering options are unlimited. I decided to use transparent Ultracote Lite available from SR Batteries\* because it's light and shows off the woodwork of the model. The Sportster lends itself to transparent covering of some sort because of its beautiful framework, but use whatever you're comfortable with. The benefits of

## FLIGHT PERFORMANCE

### • TAKEOFF AND LANDING

This is a conventional gear (tail-dragger) plane, so takeoffs and landings may offer some challenges that beginners are not used to if there is a crosswind, but there are no surprises. The tail is not steerable, but because the Sportster takes off after a run of only a couple feet, the rudder provides enough authority. I have also hand-launched the Sportster without any problem, as it only takes a gentle toss to get it going. Landings were uneventful; the plane slows down extremely well while assuming a level attitude that makes main-gear and 3-point landings things of beauty.

### • HIGH-SPEED FLIGHT

What can I say? This is an old-timer. Speed is not the Sportster's forte, but it will cruise along at full throttle against a pretty stiff breeze and remain controllable. There is a fair amount of dihedral, and on a particularly gusty day, this provided some interesting flying, as the model tried to roll over onto its back while turning. "High-speed" flying reduced this, however, and kept it controllable—even on a day when I should have stayed at home.

### • LOW-SPEED FLIGHT

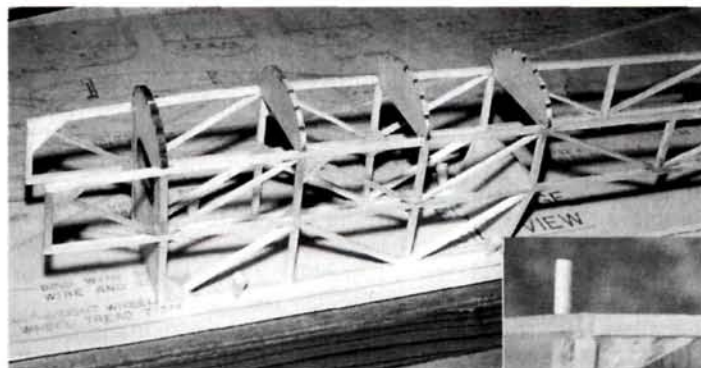
This is something the model does extremely well along with thermalling.

The undercambered airfoil is very efficient in this regime, and with a stiff breeze, you can hover the plane. On a calm evening, it is relaxing to fly, and it can be flown in small fields because it can slow down so much. At low throttle and with full up-elevator, the model just mushed along straight ahead and descended gently, never really entering a "stair step" profile. Turning the motor completely off will produce a gentle stall of no consequence; the Sportster easily recovers with either motor or airspeed.

### • AEROBATICS

OK; this is not why you build an old-timer, but this model will loop and, if you have the altitude, it can do a very big sloppy roll. The plane will spin when forced to and will recover nicely with some throttle and

opposite rudder. Inverted flight is possible, but this requires a fair amount of elevator. The most aerobatics I did with it were by accident because I took it out on a day not fit for flying slow old-timers. The gusty wind tossed the little plane around, but the impressive part of this experience was how well it recovered after each assault. Although I don't expect to fly this model in these conditions again, it was nice to see how well it handled because on a booming thermal day in North Carolina, there can be some rough air.

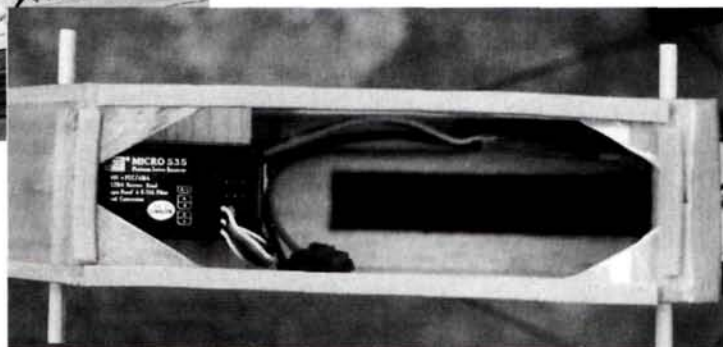


*The fuselage should be placed square over the plan before you place the bottom formers. Framework such as this just begs for see-through covering.*

certain coverings are explained in the instructions.

There isn't much to final assembly aside from gluing on the tail feathers and connecting the controls. The usual cautions are provided about getting everything squared up and true, so go slowly; you'll be rewarded with a plane that doesn't present trimming challenges on the test flight.

Overall, I found the Spirit of

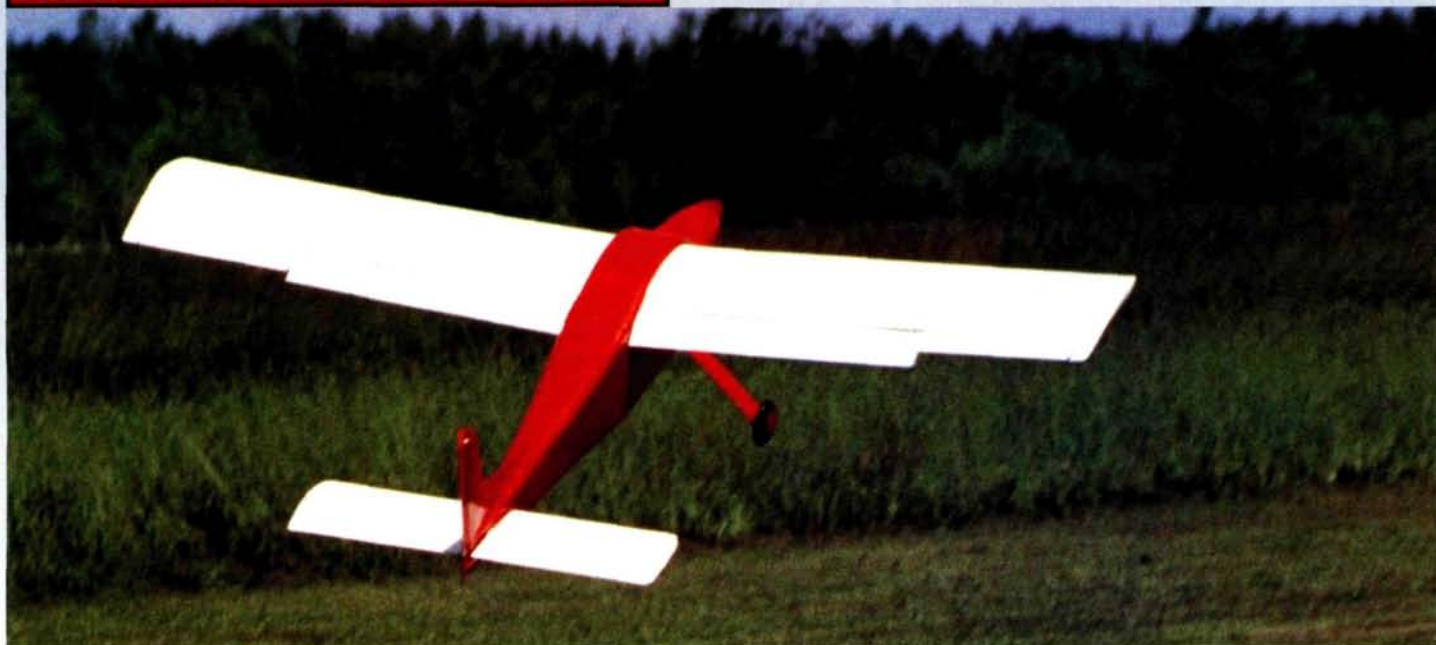


*Beneath the wing saddle, the receiver is mounted on a removable tray above the servos. The hook-and-loop fastener allows you to position the motor battery for proper CG. (Layout of the radio equipment is left to the builder's preference.)*

Yesteryear's Dallaire Sportster to be a great way to learn about the light, strong construction techniques used in old-timer models, and it's a relaxing flyer at the field. It performs well on electric power and should perform equally well with a 1/2A engine on its nose.

Whether you're a relative newcomer to RC airplanes or someone who wants to rekindle some fond memories, the Dallaire Sportster is a great model to build and fly.

*\*Addresses are listed alphabetically in the Index of Manufacturers on page 134. +*



# The Robin

by Andy Lennon

**W**hen I designed the Robin, I wanted it to be larger than the usual .46-powered plane for better in-flight visibility and yet remain easy to transport. I wanted it to have a weight-to-power ratio (power loading, or P/L) of not more than 250 ounces per cubic inch of engine displacement (cid). This means that powered by a .46 engine, the model's maximum weight had to be no more than 115 ounces (.46 x 250). With a maximum wing area of 828 square inches, the wing loading would work out to be 20 ounces per square foot.

I reduced drag by carefully selecting the wing and tail airfoils, by contouring the fuselage and engine cowl and by using fairings on the landing-gear wire. I also tried to strike a balance between stability and maneuverability, as too much stability would inhibit the model's maneuverability. I also wanted the Robin to be spirally stable.

*A .40-size sport job with STOL ability*

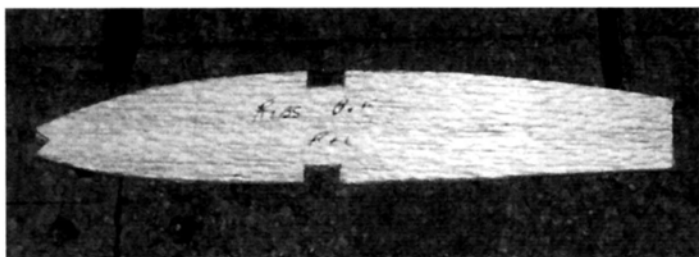


## SPECIFICATIONS

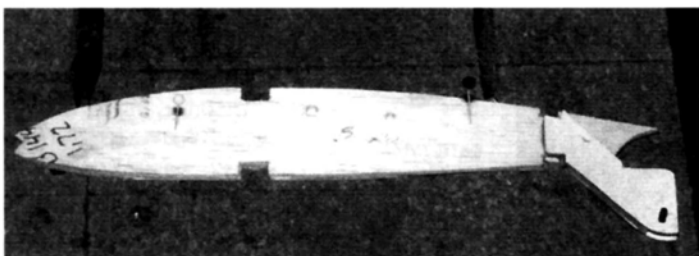
**Name:** Robin  
**Type:** sport  
**Wingspan:** 72 in.  
**Length:** 53½ in.  
**Wing area:** 819 sq. in.  
**Airfoil:** E197  
**Weight:** 6.875 lb. (110 oz.)  
**Wing loading:** 20 oz./sq. ft.  
**Engine used:** O.S. Max .46 SF  
**Propeller:** 12x7 APC  
**Power loading:** 239 oz./cid  
**Radio req'd:** 5-channel (rudder, elevator, aileron, throttle, flaps)

**Features:** the wing has NASA "droop" LE, slotted flaps and differential aileron control. The fuselage has a removable canopy that provides access to the servos, radio gear and fuel tank. The engine uses a ducted cowl for cooling, and the lower half is easily removed for service. The entire structure features "stressed skin" design throughout using balsa and plywood. Its efficient wing design and low wing loading give the Robin excellent STOL flight performance.





**Above:** this is the fixture board used to assemble the ribs and flap supports. The dummy rib and a  $\frac{1}{2}$ -inch pin (lower right) accurately locate the pivot point. This is critical to proper flap operation. **Below:** here is a completed rib and flap support assembly. Note the  $\frac{3}{8}$ -inch balsa core placed between the two plywood flap support pieces.



For short takeoffs and gentle landings, I incorporated large, slotted flaps into the Robin's wing. To obtain effective aileron control at high angles of attack (AoA), I used the NASA "safe wing droop" at the leading edge (LE). I incorporated differential aileron control to help avoid adverse yaw during turns and, to help prevent flutter, I added mass balance to the ailerons, elevators and rudder.

The model's stressed-skin construction produces a light yet strong, warp-free structure. The engine cowl provides adequate engine cooling while also offering a pleasing, turbo-prop-like appearance.

The Robin's performance exceeded all my expectations. Powered by an O.S.\* Max .46 SF engine turning an APC\* 12x7 propeller, the finished model weighs 110 ounces fueled and ready to fly. The wing area is 819 square inches, and the model's power loading is 239 ounces per cid. It has true short takeoff and landing (STOL) capability and with flaps fully extended, the stall speed is 15mph. I estimate that its maximum airspeed is 80mph.

## CONSTRUCTION

I suggest that you cut out all the parts as indicated on the plans before you actually begin construction. Also, to reduce time and effort, use small power tools such as a scroll saw, a drill press, a belt or disc sander and a high-speed drill. Photocopy the small component drawings and use the copies as templates. For example, the eight plywood flap supports can all be made at one time by lightly cementing a stack of  $\frac{1}{16}$ -inch ply blanks together and then rubber-cementing the photocopy to the top of the stack. You can then drill

and cut all eight parts at one time. Cut close to the line, then use a sander to sand the parts to final shape.

## ASSEMBLY

To assemble the small parts, I use  $\frac{1}{2}$ -inch-thick plywood surfaced with  $\frac{1}{4}$ -inch-thick cork as fixture boards cut in a variety of shapes and sizes. These are shown in the construction photos. Start construction with the wing, as it will be needed to position formers 5 and 6 in the fuselage later in the process.

Using an alignment fixture board to accurately duplicate the parts, assemble the flap supports on ribs C and E. Having identical parts is essential for good flap action. Next, assemble and sand the ailerons and flaps to shape, as these will be needed to precisely locate the flap support ribs span-wise in the wing structure. Cement the tube anchors to ribs D and G and then glue the F1 ribs to the F ribs. Note that these rib assemblies are built as right- and left-hand assemblies. Assemble the rest of the ribs, spars and square,  $\frac{3}{16}$ -inch LE strips and install the spar shear webs.

Before you install the flexible pushrods in the wing, bend the plastic outer tubes to the shape shown on the plans while using a heat gun. Then manually bend the cables. Install the plastic tubes using CA, then cement the top sheeting to both wing panels. When cementing the bottom sheeting to the wing, first place the upper side of the left wing panel on the left building fixture rails and weight the panel down to maintain straightness until the cement sets. Use masking tape liberally to cement the wing sheeting to the LE strip. When the left panel is done, do the same for the right panel. Now, install the aileron servo mount and

the wing hold-down bolt pieces. Cement the wingtips securely into place, then sand them to shape as shown on the plans.

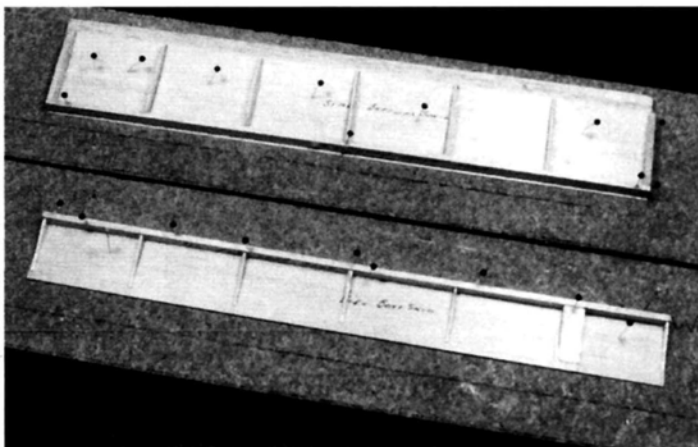
## FUSELAGE

When assembling the fuselage sides and bulkheads, two 12-inch-long,  $\frac{1}{2}$ -inch-square blocks placed at right angles to the fuselage, between bulkheads 2 and 3 and bulkheads 9 and 10, will keep the sides level. Assemble the various bulkheads over photocopies of the plans, then make the battery/receiver box. Assemble bulkhead 10 and attach the tailwheel mounting bracket. Assemble the fuselage sides, doublers and triangular supports for the tank and servo rails, then install pushrod tube anchors for the rudder (on the right side only.)

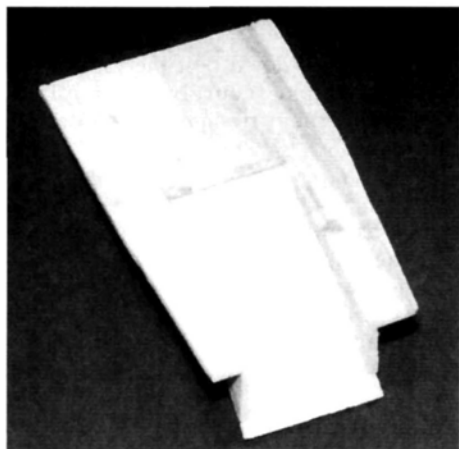
Check that both sides of the fuselage are identical by positioning them together (outside surface to outside surface). Bolt the motor mount to bulkhead 2 and add



**I used this wing assembly fixture made from pressed wood shelving to build the wings with the appropriate 3 degrees of dihedral. The wing plan is rubber-cemented on top of the fixture boards, and a  $\frac{1}{4}$ -inch square of balsa at both spars acts as a support shim while assembling the wing panels.**



**The stab and elevator assemblies take shape on a flat fixture board.**

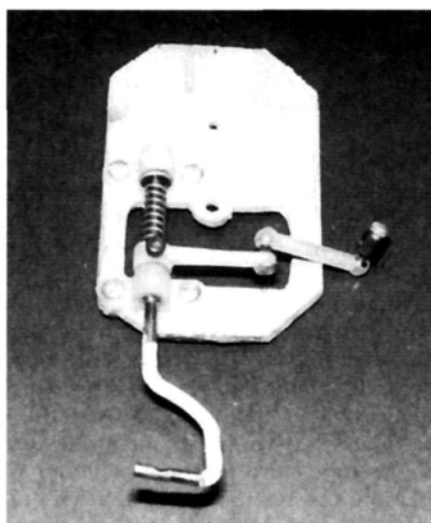


**Left: this is the cooling-air exit subassembly for the bottom of the fuselage, just aft of the engine cowl. Right: to protect the electronics, I made this receiver and battery box and cover. The box is lined with foam padding.**



the canopy hold-down dowels. Assemble the cooling-air outlet and attach to the forward, bottom sheeting that will fit just aft of the firewall. Install the bulkheads between the sides but do not cement formers 5 and 6 into place at this time.

Bolt the wing to bulkheads 5 and 6 and install the wing (make sure it is centered and square to the fuselage centerline). Carefully unbolt the wing from the formers and then cement the formers into place. This is a good time to install the landing-gear mount. Install the elevator and rudder pushrod tubes, then install the battery and receiver box. Install the radio gear (receiver battery, on/off switch and receiver), and run the antenna through the holes in the box and bulkheads. Add the top rear, bottom front and rear fuselage sheet and allow the antenna to exit at the very aft of the fuselage. Cement the balsa corner pieces to the fuselage and tape them into place until the cement sets. Carve and shape the corner pieces, then sand to the radii shown on the



**Left: the tail-wheel assembly. Note that it is offset to allow room for the control linkage. See bulkhead no. 10's details on the plan.**

plans. Install the ply servo and tank mount rails, then cement the triangular bracing to bulkhead 1 and to the landing-gear mount. Install the fuel tank and the servos. Note the "up-down" location of the E2 connectors on the aileron servo arm.

Assemble the canopy on the fuselage as shown in the photos, then carve and cut it to shape. The construction photos show the engine cowl as it is built in place on the fuselage. My article, "Ducted Cowl Design, Part II" in the September 1994 issue of *Model Airplane News* (as well as the plan) shows the finer details of the cowl's construction.

## HORIZONTAL TAIL

Assemble the stabilizer and elevators on plywood fixture boards as shown in the photos. While bending the music-wire elevator horn to shape, slip it into the 1/4-inch-long piece of 1/8-inch-diameter brass tube before making the

second bend. Ensure a solid solder joint between the brass and steel parts of this assembly. Heat well!

Finish the tail by adding the balsa block tips and mass balance weights, then install the control horn in the elevator halves.

## VERTICAL TAIL

The rudder is built similarly to the elevators. Cement ribs F1, F2 and F3 to the fin spar using gussets as shown. To make it easier to install the antenna wire, run a piece of strong, thin cord through the holes. Use the cord to pull the antenna through the fin later. Add the left and right sheeting, then add rib F4. While the cement is setting up, tape the leading edges of the sheeting into place.

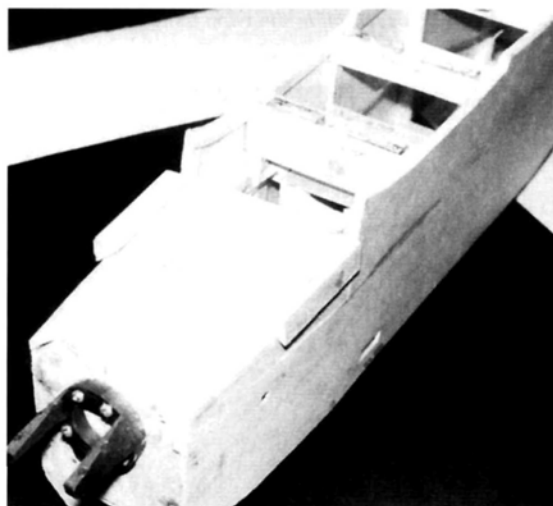
After the cement has set, add the side sheeting of dorsal fin and add the front block. Carve and sand to shape. Finally, add the tip

## FLIGHT PERFORMANCE

Takeoffs at full throttle with flaps half extended and while holding slight up-elevator are surprisingly short (under 6 feet), and the climb angle is steep. Retracting the flaps causes the model to nose-down, but this condition is self-correcting, as the model accelerates because it is free from the flap drag. Flight is smooth, and the Robin is highly responsive to the controls. It does any maneuver in the book easily and gracefully. It is spirally stable.

Landings require a special procedure. This model is aerodynamically slippery, and it is easy to overshoot the landing with the flaps up, particularly if the engine idle is on the high side.

Approach with about 100 to 150 feet of altitude, then, at a reasonable distance, set the throttle to idle, lower full flaps and simultaneously push the model down to a 45-degree dive, aiming at a point just before the field threshold. The lift and drag from the flaps will prevent the model from accelerating. At 15 to 20 feet, level off to a not-too-shallow glide and gently add up-elevator to raise the nose for a nearly stall touchdown. The runout after landing on grass will seldom exceed 6 feet.



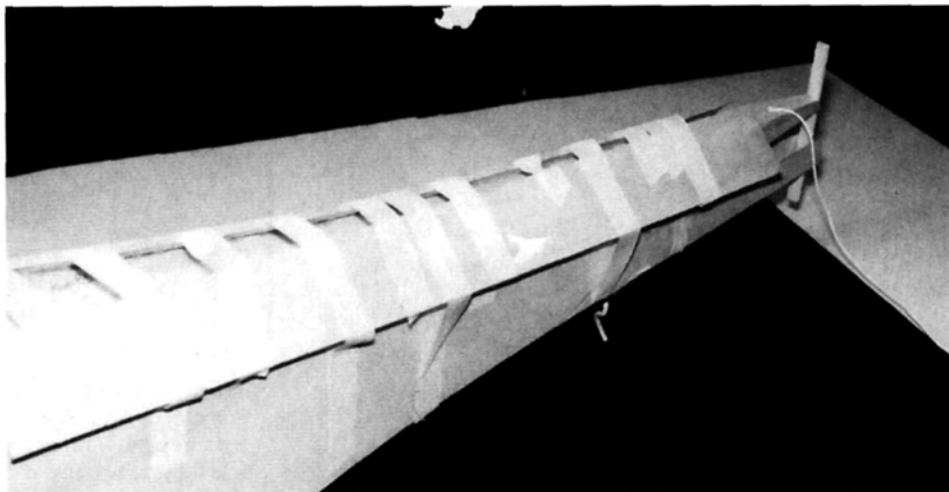
**Here, the front portion of the canopy is being assembled on the fuselage.**

## THE ROBIN

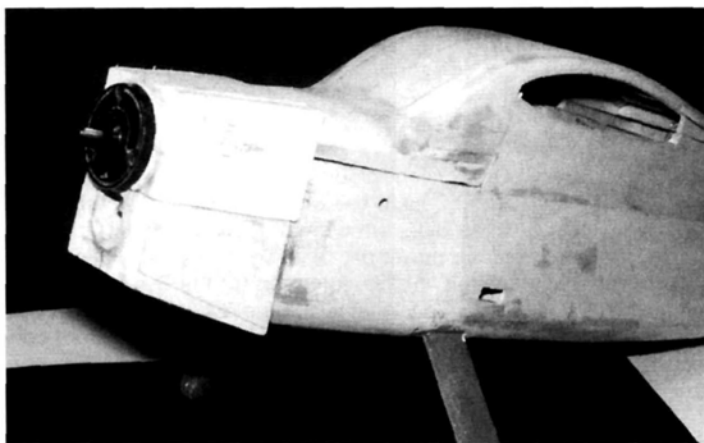
blocks and mass balance weights. To ensure free movement, temporarily hinge the ailerons, elevators and rudder with masking tape. Then disassemble the model for covering.

### FINISH AND PAINTING

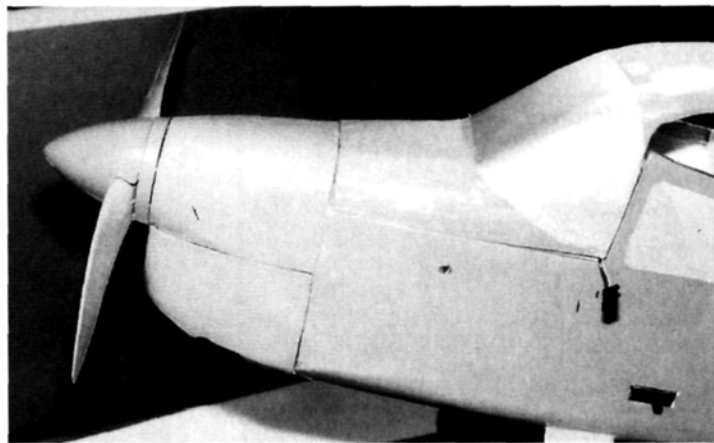
To keep weight down, I suggest using MonoKote\* to cover your model. The hinging of ailerons, elevators and rudder is part of the covering process. The horizontal and vertical tail surfaces are covered before they are installed on the fuselage. Remember to leave a portion of the horizontal stab bare (top and bottom) so you can securely cement it into place. I painted the cowl, wing and tail tip blocks, landing-gear fairings, wheel hubs and under-wing flap mechanisms.



*Tape is used to hold the  $\frac{3}{16}$ -inch upper-rear corner pieces as the glue dries. The fuselage is then planed, cut and sanded to shape.*



*The cowl "box" structure is temporarily attached to the fuselage so it can be shaped and sanded. Note the use of the spinner backplate to help shape the nose.*



*The finished engine cowl in position.*

### ENGINE

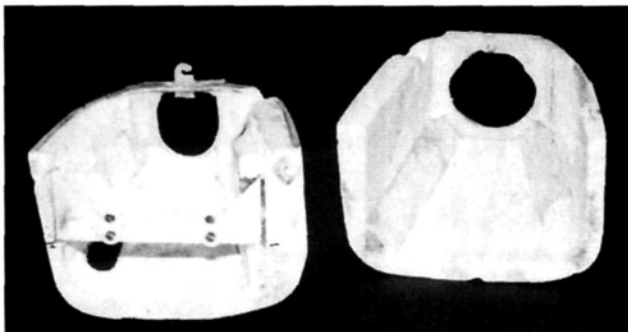
To make engine starting a bit easier, I installed a remote glow-plug energizer and wired it to a jack on the side of the fuselage. If you use one, install the jack on a  $\frac{1}{16}$ -inch ply mount, then securely cement this assembly to the inside of the fuselage. I installed the jack on the left side of the fuselage just aft of the engine cowl separation line. I hooked one wire to an engine-mounting bolt, and I soldered the other wire to the glow-plug clip.

Since the Robin must be inverted on

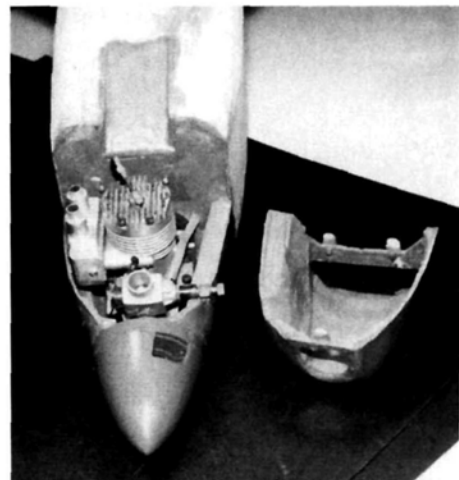
the field box for start-up, I installed a ball-check valve in the fuel pressure line. The valve prevents fuel from flowing from the tank to the muffler. When the model is upright, the ball rests on the filter screen. I use a three-line fuel-tank plumbing setup, and I plug the third (fill) line with a rivet. Take the canopy off when you fill the tank so you can see the fuel level; this way, you won't waste any.

### FINAL ASSEMBLY

Install the horizontal tail surface while hooking up the clevis to the elevator control horn. Cement the vertical fin into place on the fuselage and pull the antenna through the fin while doing so. Connect the clevis to the rudder horn. Slip the flap-pivot ribs into the flap supports and secure the flaps in place by installing the pivot pins; a drop of cement applied to the pin openings will hold the pins. After you've bolt-



*Here you can see the inside details of the engine cowl. Note the attachment brackets.*



*With the lower portion of the cowl removed, there is unrestricted access to the engine and muffler.*

ed the landing gear into place, assemble the components for the cover that goes under the landing gear, cement it into position, and you're done.

Happy landings!





# PLANES WORTH MODELING

## 3-View Documentation for Scale Modelers

by Geoff Cozine

### FIESELER FI.156C-3 STORCH



In 1935, a call went out from the German government for a plane that could take off and land in highly restricted spaces. This call was answered by Gerhard Fieseler and his chief designer, Reinhold Mewes. Their design—the Fi.156C—fit the German Air Ministry's request perfectly.

Takeoff speed could be reached within around 75 feet, and the Storch climbed at an incredibly steep angle, so confined spaces were no problem. In addition, the Fowler flaps, which increased the Storch's wing area by 18 percent when fully deployed, and the flaperons, which deployed when the flaps were extended past 20 degrees, gave this craft the ability to land in a space less than 100 feet long. The Storch's inverted V-8 engine afforded the pilot great visibility (he could see the wheels from inside the cockpit), so obstacles could be dodged to a certain extent, and if a rut was hit or a landing was extraordinarily rough, shock absorbers on the landing gear took the brunt of the blow.

Because it could operate with so little landing space and was able to fly so slowly, the Storch was used for staff transportation, short-range reconnaissance and other general-purpose duties. A Storch was responsible for rescuing Benito Mussolini, who was being held captive in a hotel at the top of the almost inaccessible peak of the Gran Sasso Massif in the Abruzzi Malise. It was also a Storch that delivered General Ritter von Greim to Berlin in the last hours of the



## SPECIFICATIONS

**Name:** Fieseler Fi.156C-3 Storch

**Wingspan:** 46 ft., 9 in.

**Length:** 32 ft., 6 in.

**Wing loading:** 9.94 lb./sq. ft.

**Weight:** 2,050 lb. (empty), 2,920 lb. (fully loaded)

**Maximum speed:** 109mph

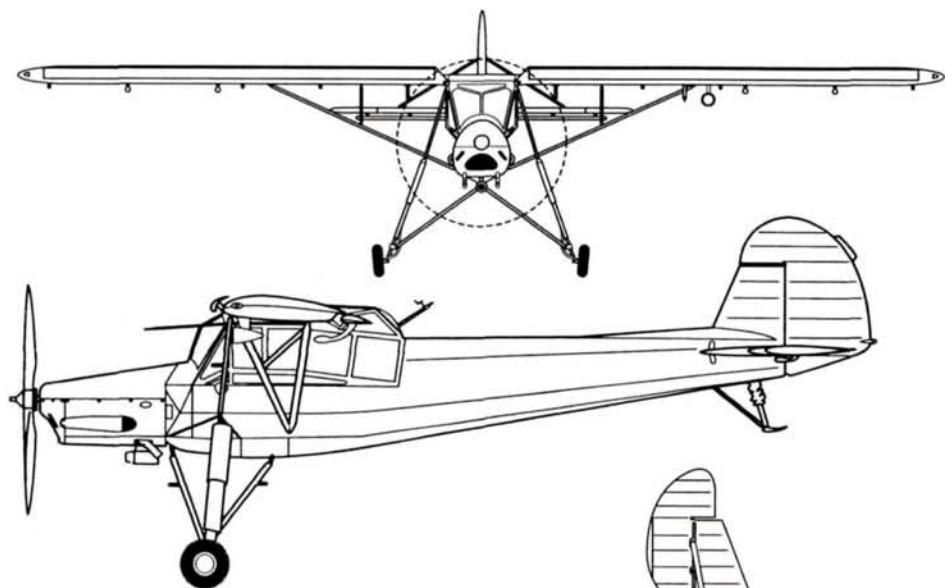
**Official landing speed:** 24.8mph

**Passengers:** pilot plus up to two passengers (in tandem)

**Powerplant:** one 240hp Argus As 1-c-3 inverted V-8

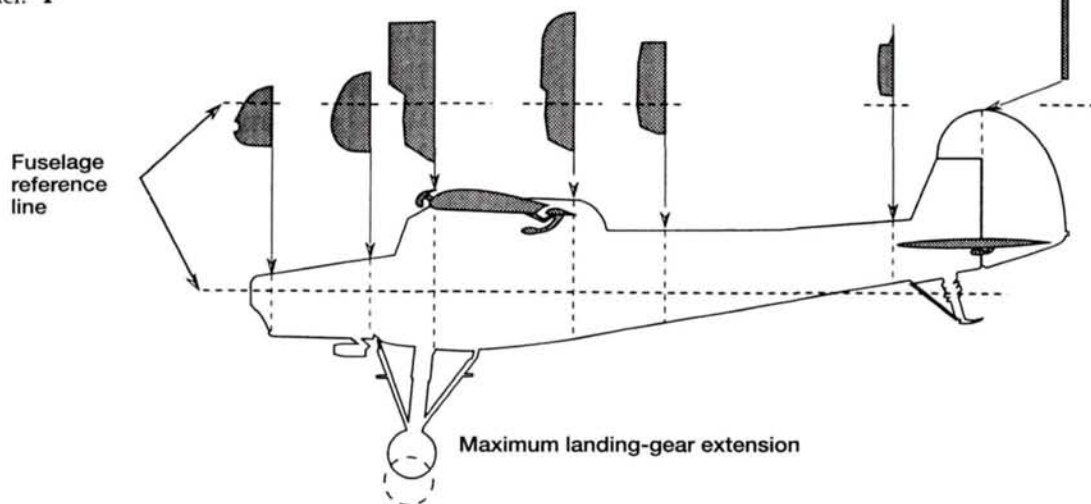
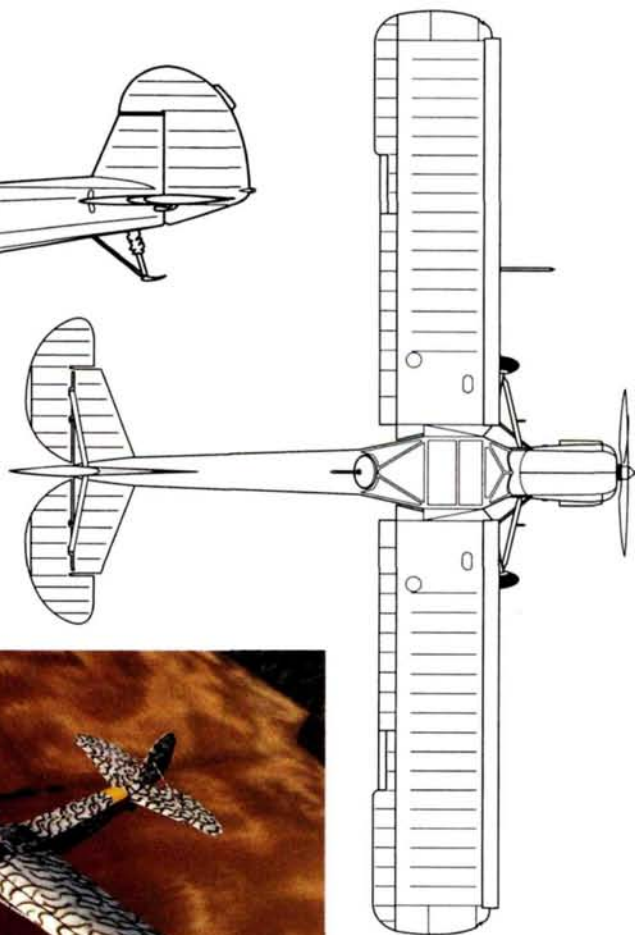
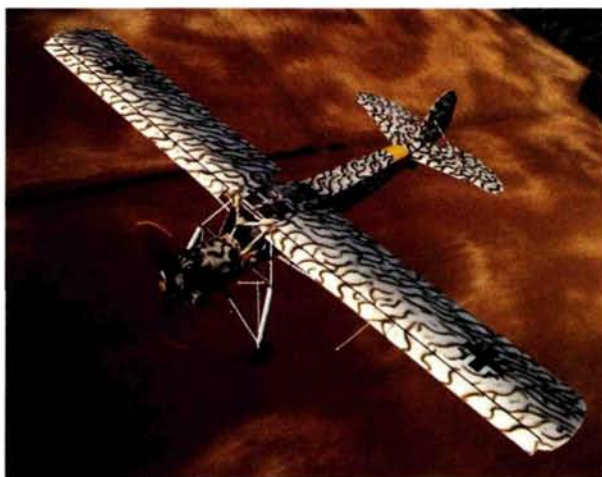
**Armament:** one 7.92mm MG 15 machine gun (rear-mounted)

**Maximum range:** 630 miles (pilot only), 240 miles (fully loaded)



War so that Hitler could make him the head of the *Luftwaffe* after Göring's dismissal. Still, the Storch rarely found the glory it deserved and was usually saddled with laborious general tasks, although Morane-Saulnier, the plant in occupied France responsible for making it, continued to do so after the War's end.

Even though it is not well-known, the Fi-156C Storch is truly a great aircraft worth modeling attention. Although it mostly served as a "grunt" laborer, the tales of Storchs dodging Mustang fire by flying at below stall speeds between the buildings of Paris while making abrupt 90-degree turns down side streets definitely conjure up a picture worthy of awe and one worthy of reproduction in an RC model. ✈



# Fiberglass with Nitrate Dope

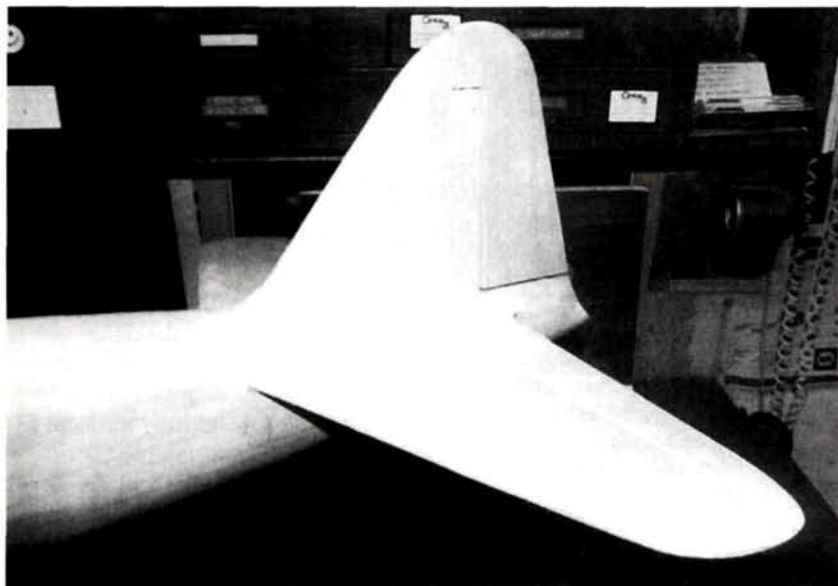


**F**or years, I have used epoxy or polyester resin to apply lightweight fiberglass cloth. Both work quite well on balsa-covered airframes, but applying cloth is usually time-consuming and messy. Back in my free-flight and control-line days, I covered balsa sheeting and planking with silk and nitrate dope. Why not apply fiberglass cloth the same way? Nitrate dope offers great adhesion, it sands well and is lighter than epoxy or polyester resin, and it's also quite easy to apply!

Set up your work surface in front of a window with a good strong fan in it, and use a good charcoal-filter mask while you work (if you can smell the dope, the mask isn't adequate).

## MATERIALS NEEDED

- 0.6-ounce Dan Parsons\* fiberglass cloth.
- Thinned Sig\* nitrate dope.
- Sandpaper (200- and 150-grit).
- Vacuum cleaner.
- Cotton gloves.
- 1½-inch paintbrush.
- Razor or hobby knife.
- Charcoal-filter breathing mask.



*A lightweight  
alternative to resins*



**1** First, make sure the balsa is smooth. You can make a good, lightweight divot filler by mixing talcum powder with nitrate dope to form a putty. Fill any dents and divots with the putty; it will dry in just a few minutes. Sand the entire surface with 220-grit sandpaper, then vacuum the surface until it's dust-free.

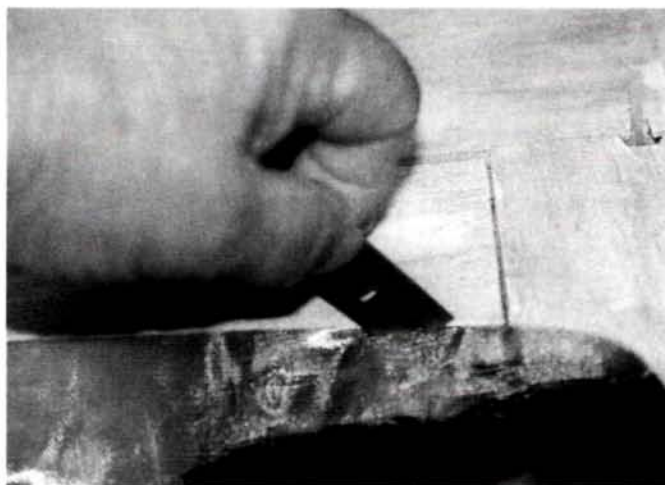
**2** Now brush on three coats of thinned nitrate dope, sanding between each coat. Be sure to vacuum between each coat.



- 3** The entire surface is ready for fiberglass cloth. Cut your fiberglass about 2 inches larger all around than the part to be covered. Wearing cotton gloves, place the cloth on the surface and smooth it out. To prevent it from getting snagged, brush the cloth from the center outward; the static charge will hold it in place.

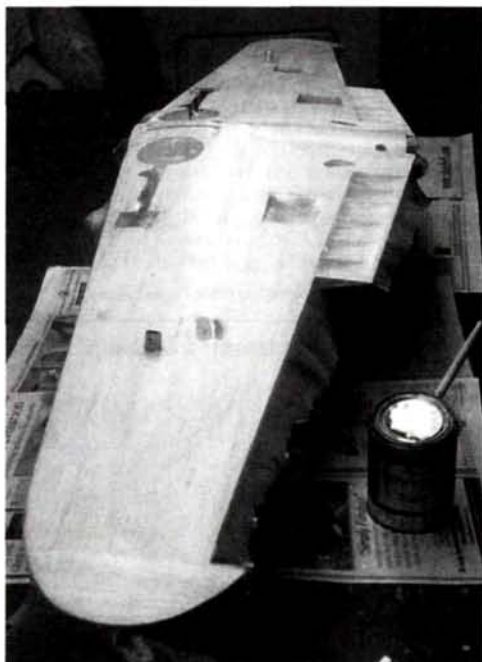


- 4** Using a soft, 1½-inch brush, start in the center and work outward, brushing on a coat of thinned dope. Wet the cloth completely. The cloth will lie smoothly and bend easily around compound curves. After one surface has been glassed, set it aside and go on to the next piece. In a warm shop, the cloth will dry in about 20 minutes.



- 5** When it's dry, the fiberglass is easily cut with a razor or hobby knife. Trim off the excess cloth, and sand the edges with 150-grit sandpaper.

- 6** Now, dope the cloth on the other side, overlapping it at the edges. After it has dried, sand the overlaps and then the entire surface with 220-grit sandpaper. Be careful not to sand through the cloth. Brush on three more coats of dope, sanding lightly between coats as before.



- 7** The airframe is now ready for primer. I use a light gray automotive-lacquer primer because it adheres well to the doped surface, and it's easy to sand. Using this method, I fiberglassed my .60-size Zero in one afternoon and the floats in another. I really like this method and will use it again.

*\*Addresses are listed alphabetically in the Index of Manufacturers on page 134. †*



## Flying a straight line

**B**ACK IN THE January 2000 issue, we discussed getting our heli up into hover and how to move it from left to right as well as forward and backward while keeping the tail pointed at us. This time, let's talk more about controlling the heli and focus on tail-rotor control so we'll be able to point the heli's nose in the direction of flight.

Take note that all hovering maneuvers should start from and return to a "home position." It is very easy to become disoriented, so developing a familiar hover position to return to in case you get into trouble as you move the heli around is very helpful.

First, learn to move the heli at a slow, constant forward speed; this requires that you walk alongside it as you move forward. This may sound confusing, but it's fairly easy. Start by facing into the wind (if any); stand about 15 to 20 feet behind and slightly to one side of the heli, and bring it into a steady home-position hover. Apply a little forward cyclic, and allow the heli to move forward. Keep its nose pointed into the wind, and slowly walk forward to maintain your the 15- to 20-foot distance between you and the heli. The farther you allow the heli to get away from you, the harder it will be to see what it is doing. To maintain orientation, concentrate on the heli's nose or on the whole fuselage—not on the tail. This will keep the stick input and control reactions similar (left is left, etc.). Continue to walk in a straight line, maintaining control until you get to the end of your field, then land.

This exercise teaches you to modulate the forward and aft cyclic control to keep the heli moving forward (see Figure 1). This will be very important as you start to expand your flight envelope (as you will see later). When you have landed, you can carry the heli (after stopping the blades) back to your starting point, or just take off, turn around and "walk" the heli back to where you started. Once you've done this a few times, with little effort, you should be able to walk and keep the heli moving at a slow, constant speed and maintain altitude.

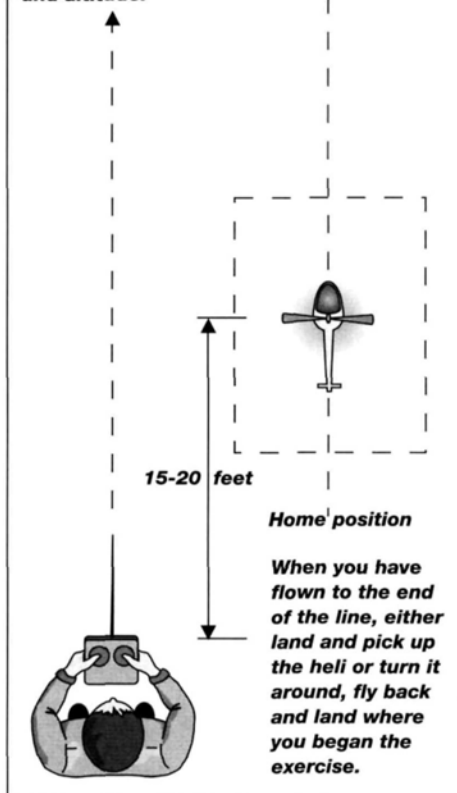
During this exercise, you'll also learn that very little stick movement is required to get the heli moving and that control inputs must be smooth if the heli is to transition successfully from hover to forward flight. Once you have the walking exercise down pat, to make things more interesting, add tail-rotor control to your practice session. Move the heli forward in



**The new rigidly built JR .60-size Vigor is becoming very popular.**

**Figure 1. Straight-walk exercise**

**From a stable hover, walk your heli slowly along a straight line, constantly keeping it at the same distance away from you. Maintain a constant heading and altitude.**



a straight line as before, but this time, while walking in a straight line, zigzag the heli across your path.

From a stable hover, take the heli into forward flight, but add a little left or right tail-rotor input to point the nose 45 degrees away from the straight-forward line. When the heli has traveled 6 to 7 feet away from the line, apply opposite tail rotor to swing the nose back, and move the heli back across the line until it is about 6 or 7 feet on the other side of it (see Figure 2).

It's OK to let the heli "crab" a little sideways until you get a feel for the control inputs, but the idea is to point it in the direction of flight and to fly straight in that direction. Do not let the heli get away from you; if things become a little overwhelming, return the heli to the "home" position, calm your nerves and start again. Fly the zigzag pattern until you reach the end of the field, and then return to the starting point as you did before. Practice this maneuver until it feels comfortable. Zigzagging teaches you to coordinate tail-rotor control while in forward movement, and this leads to the next step—S-turns.

Learning to do S-turns is a great way "to sneak up on" unrestricted forward flight, and I'll talk about S-turns the next time.

### R/C AERO PAGEANT

Late last fall, the R/C Aero Pageant took place in Ojima, Japan. For those who

haven't heard of this weeklong event, it is one of the largest in the world. All major disciplines of RC are represented, and winners earn really big money prizes. The pageant draws 30,000 to 40,000 spectators!

As you can imagine, RC helis are popular, and the top 10 freestyle competitors from around the world were invited to compete in 3D aerobatics. The heli guys in Team USA were Ray St. Onge, Gary Wright and Curtis Youngblood.

The first two days are for sightseeing, unpacking helis, registration/processing and the opening reception. Then come practice and preliminary rounds and the finals. To give you a taste, here is a partial list of the pilots' maneuvers: low-level death spins, sideways and backwards Cuban-8s, backwards rolling circles with pirouettes, pirouetting rolls, flips and pirouetting autorotations. To say the least, these antics must have been very exciting to watch.

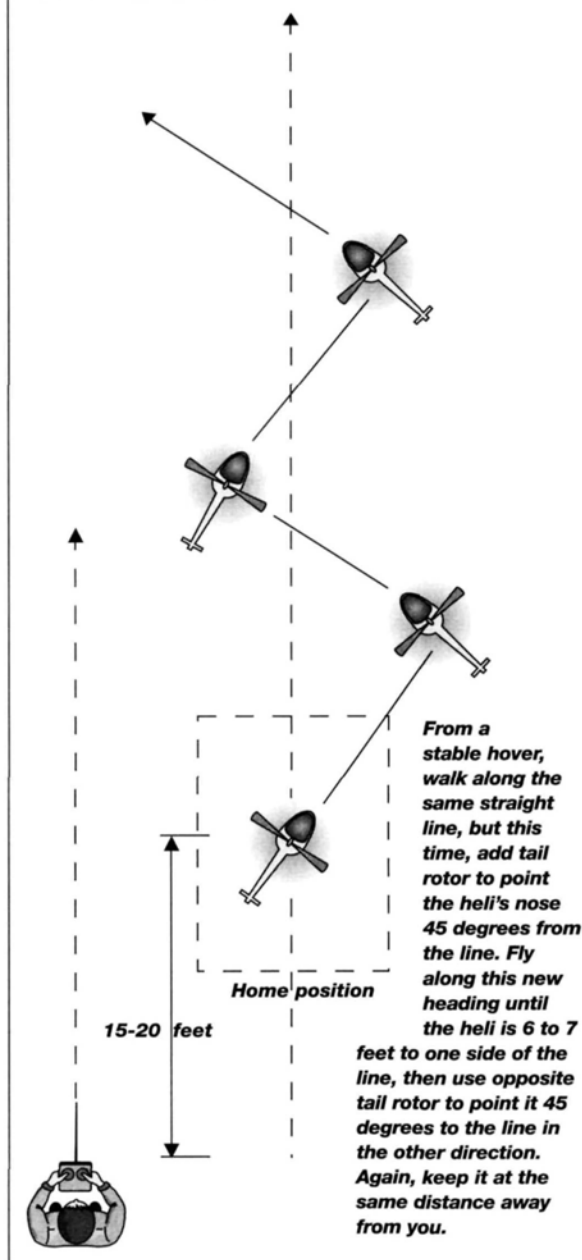
## THE FINALS

1. **Curtis Youngblood**, JR Vigor  
USA
2. **Kazuya Yamaguchi**, JR Imperio  
Japan
3. **Gary Wright**, Millennium  
USA
4. **Bob Johnson**, Futura SE  
Great Britain
5. **Rüdiger Feil**, Hirobo Eagle 2  
Germany
6. **Ray St. Onge**, X-Cell  
USA
7. **Kazuyuki Sensui**, JR Superio  
Japan
8. **Mark Christy**, Hirobo Eagle 2  
Great Britain
9. **Yukihiro Dobashi**, Hirobo Eagle 2  
Japan
10. **Javier Valdeomos**, Futura SE  
Spain

*Curtis Youngblood shows off his new JR Vigor. He won first place in Freestyle Helicopter at the prestigious R/C Pageant in Japan (photo by Julie Youngblood).*



**Figure 2. Zigzag exercise**



Curtis was awarded a check for 2 million yen (several thousand dollars)!—not bad for a model contest! I am told that videos of the R/C Pageant will be available from Curtis later in the year.

Photos and more information are available on Curtis's website: [www.curtisyoungblood.com](http://www.curtisyoungblood.com)

## JR VIGOR

The newest heli I had a chance to look at is the JR\* Vigor 60. Developed by Curtis Youngblood and the JR heli engineers, this potent machine is designed to withstand the stresses of 3D aerobatics and precision contest work. The Vigor incorporates several design features that make it one of the most rigid machines available. Its two-piece frame features a multipiece horizontal aluminum I-beam and three nylon vertical I-beams that all lock the frame pieces together. A unique box-around-the engine design achieves structural integrity without relying on the engine installation to transfer loads.

The Vigor also has a relatively low parts count and a ready-to-bolt-on, factory-built head; it is said to have a 10-hour building time. The white polypropylene canopy is blow-molded and comes with two sets of decals. The main shaft features "wide-space" ball bearings that are about 50 percent wider than most for better support. A total of 47 ball bearings are included. Though not intended as an entry-level heli, the Vigor would make an outstanding, all-around heli for the Sunday pilot who wants precision and performance.

JR has also developed a heading-hold gyro that will be available in early summer. Curtis Youngblood used one of the new gyros in the Vigor that he flew at the R/C Pageant; its holding power is said to be "unbelievable." I'll have more information on it soon and will share what I find out in a future column; so until next time, keep practicing and fly safely.

*\*Addresses are listed alphabetically in the Index of Manufacturers on page 134. ✦*



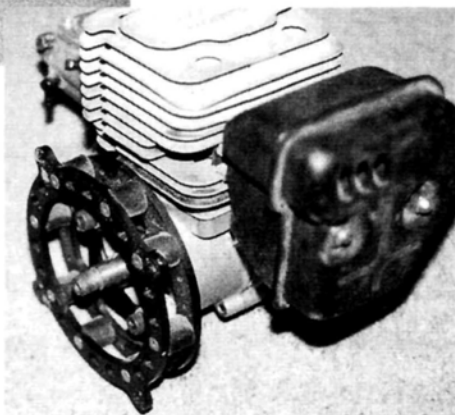
## Making big engines fit

I think it is a foregone conclusion that gasoline engines are the most popular powerplants for giant-scale models. Gas engines come in a wide range of sizes and, in general, are very well-suited to the tasks given them by giant-scale modelers. If the model is designed for a gas engine, then installing it is usually a simple task. But, what if you want to install an engine different from that called for in the plans?

When you build a giant-scale model, the plans usually show you where everything has to go. If you want to do things "your way" and modify the engine installation, this simple task becomes more complex.



**Above:** gasoline engines are the most popular means of powering giant-scale models; installing one is usually a simple task. When you change things around, however, installation is more complex. **Left:** this circular isolation mount attached to my G-62 takes up some of the space between the engine and the firewall. An extended box structure is often required to support the engine at the proper distance from the firewall.



### MAKING IT FIT

When building a model, one thing is for sure: you simply cannot change just one

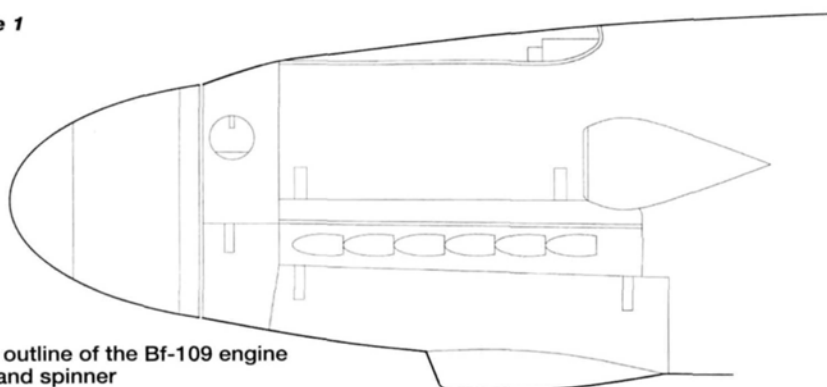
thing! When you make a single change, you ultimately have to redesign other parts of the model to make that modification work. It's an example of the domino effect; for instance, change the length of the engine, and you must compensate by adjusting the engine-mounting system. A new mounting system could mean that you have to change the position of the firewall; this could affect the fuel tank installation, and ... you get the idea.

Engine position is especially important if you have a model with a spinner. Regardless of the length of your engine, the spinner's location relative to the rest of the model has to be maintained. To keep everything as simple as possible, I try to restrict my changes to one area of the model. Instead of moving the firewall forward or aft to accommodate

a different-size engine, I prefer to add a box structure to support it. Here's how to do it.

To establish a fixed reference point

Figure 1



Scale outline of the Bf-109 engine cowl and spinner



**The AvioMac 85cc 2-stroke looks impressive. It comes equipped with a Quick-Start unit that makes firing it up easier.**

from which to establish the correct engine position, attach the spinner to the engine and work with the entire assembly. You can then take the engine/spinner combo and place it on the plans to determine the correct distance between the firewall and the engine-mount plate. Sometimes, your engine mount will take up this space and you can simply bolt it to the firewall. If this isn't the case, the space left must be taken up by the engine box.

If you haven't already begun to build your model, you have several options; establishing the engine installation details before construction is definitely preferable. You can cut and glue the firewall before attaching it to the inside of the planked fuselage (see Figures 1 through 3).

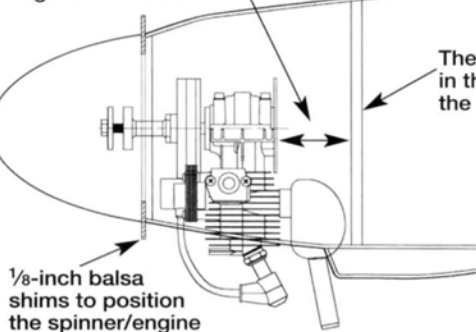
But what if the firewall is already installed? I recently started a project before I had the engine in hand to measure. I built the fuselage, remembering that later I would have to work out the engine-mount location. With the fuselage already built, I placed shims between the spinner and the front of the fuselage. By doing this, I established a little leeway for any misalignment in my engine installation.

I first tack-glued several 1/8-inch balsa shims to the front of the fuselage's foremost bulkhead and slipped the engine and spinner assembly into place. I then butted the spinner's backplate against the shims and carefully aligned the spinner with the rest of the fuselage. Once the spinner was in the correct position, I tack-glued it to the shims with thin CA. As it is made of aluminum, the spinner is easy to break free of the shims later on.

With the spinner glued into place, the engine is suspended and at the exact distance it needs to be in front of the firewall. It is a relatively simple task now to build an extension box of the exact size and shape needed to support the engine.

For the Brison\* 3.2 used in my Meister Scale\* Bf-109, I made the engine-mount

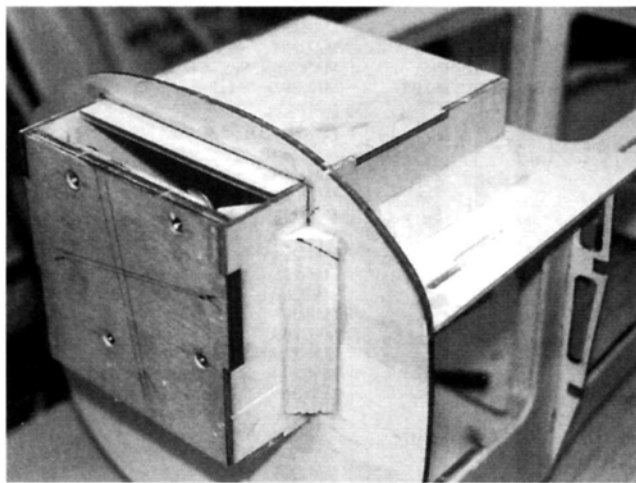
This area must be filled with the engine box structure.



**Figure 2**  
Internal structures of the model Bf-109

box from 1/2-inch-thick birch plywood for the box face and 1/4-inch ply for the four sides. I used 10-24 blind nuts to install the engine and 30-minute epoxy to glue the box to the firewall. Epoxy by itself is not strong enough to take the stress of engine vibration, so I used 1/2-inch, aluminum, L-angle stock to reinforce the glue joint all around the box. Use either large sheet-metal screws or 6-32 cap-head screws and blind nuts to attach the angle stock to the box and firewall.

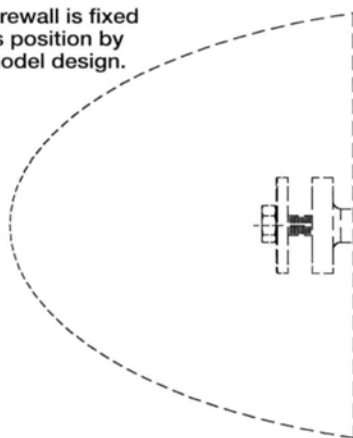
I've used this engine-installation technique on several models and have never had a problem with the engine-mount box coming loose. Give it a try.



**Above:** manufacturers often incorporate adjustable engine-mount box structures in their models (here, a Lanier RC<sup>®</sup> Ultimate Pitts). Since you can slide this structure into and out of the firewall before it is glued into place, it makes engine installation and positioning much easier. **Right:** the plywood engine box has been epoxied to the firewall of my Bf-109. Aluminum L-angle stock will be screwed to the box and firewall to form a strong engine installation.

## MACMINARELLI ENGINES

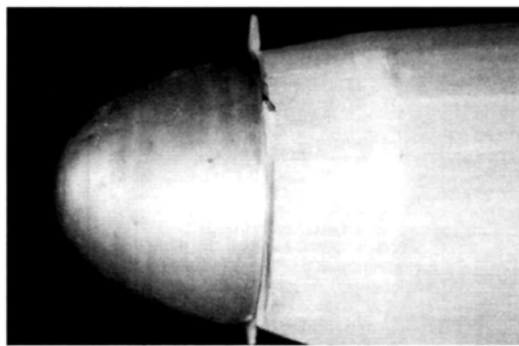
At the Toledo trade show a couple of years ago, I saw some really interesting multi-cylinder engines on display. Imported by



**Figure 3**  
Engine box structure

Tower Hobbies\*, the AvioMac 70cc, 85cc and 125cc engines come from the 20-year-old Italian company, MacMinarelli. It has a lot of experience in manufacturing 2-stroke engines; the company's main product line is competition go-karting engines. Far from being redesigned go-kart engines, the AvioMac gas engines are designed with CAD/CAM 3D systems using state-of-the-art materials and modern CNC-machining techniques. These powerplants are beautifully manufactured and carry a three-year warranty.

All of the AvioMac engines come with two spark plugs, a coil with



**Above:** I have tack-glued the spinner/engine assembly to the front of the fuselage. The shims make fine adjustments possible (if needed) later in the installation.

ignition leads, a control box and another little black box called a Quick-Start unit. By adjusting the timing electronically until the engine comes on line, this device makes it easy to start the engine. Once the engine starts running, the CD ignition system takes over and the Quick Start unit can be disconnected and removed.

The opposed twin cylinders work boxer-style and fire simultaneously, thus greatly reducing vibration. The pistons feature dual rings, and roller bearings support the conrod. The AvioMac 85 shown here has reed induction (in the crankcase) and has an 85.897cc (5.24ci) displacement. The engine produces about 7 1/2hp, with recommended prop sizes being 24x12, 24x10 and 26x12. The rpm reading for the 26x10 prop is an impressive 6,300 to 6,400. Mufflers are available but are not included with the engine. A bench test on the AvioMac 85 is in the works, so we'll soon see how well this impressive-looking engine runs. Given its strong lineage, I'm sure it will be a good choice for IMAC-inclined modelers.

\*Addresses are listed alphabetically in the Index of Manufacturers on page 134. ✦

# PRODUCT WATCH

*Editors' picks of the month*

**AT MODEL AIRPLANE NEWS,** we not only tell you what's new, but we try it out first to bring you mini-reviews of the stuff we like best. We're constantly being sent the latest support equipment manufacturers have to offer. If we think a product is good—something special that will make your modeling experiences a little easier or just plain more fun—we'll let you know here. From retracts and hinges to glow starters and videotapes, look for it in "Product Watch."

Excel Hobby Blades Corp.

## Tools and Cutting Accessories A cut above

The folks at Excel should be on your "get to know" list. They have one of the most extensive lines of hobby tools and cutting accessories I've seen. Their catalog has

scores of cutting blades, carving tools, clamps, jewelers'

saws, drills, cutting mats, frames, knives, files and more! I know I could completely restock both my field

box and the pegboard in my workshop

and still not make a dent in Excel's product line! I've

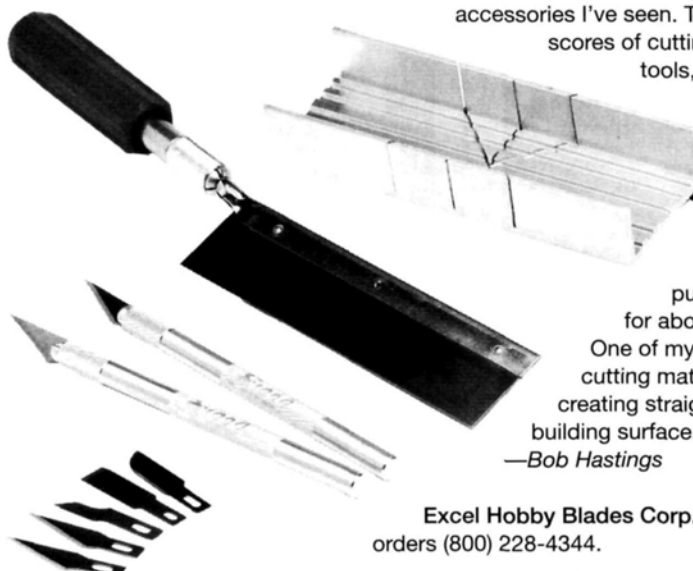
put Excel's miter box, razor saw and hobby knives to the test

for about a month now, and I'm very pleased with their durability and sharpness. One of my new favorites for building small, stick-frame slow flyers is Excel's self-healing cutting mat. The smooth cutting surface has a grid pattern printed on the face—ideal for creating straight cuts. The multi-ply material resists gouging and provides a warp-free

building surface.

—Bob Hastings

Excel Hobby Blades Corp., 481 Getty Ave., Paterson, NJ 07503; (973) 278-4000; fax (973) 278-4343; orders (800) 228-4344.



Sirius Electronics

## Sirius Charge 100 Charge it, please

I run 50 and 110mAh Ni-Cds in my smaller indoor and slow-flight models. Charging these smaller capacity cells used to require that I monitor the peak with a voltmeter. This technique demands the total concentration of a modeler; of course, overcharging quickly ruins batteries, and undercharging leads to inferior performance. I found an economical and convenient alternative in the Sirius Charge 100.

This unit peaks 4- to 8-cell packs of 50 to 200mAh capacity at a regulated 100mA rate. It takes about 30 minutes to charge 50mAh cells, an hour for 110s and 2 hours for 200mAh. The charge time is shorter if the packs have not been completely discharged beforehand.

The Charge 100 is housed in a durable cast-aluminum enclosure with no dials, switches or buttons to adjust. The charger includes a pair of alligator clips

and a prewired receiver battery connector. The charger is protected from reversed input polarity, and likewise won't harm the battery you're charging if it's connected backward. The charger requires from 7.3 to 18 volts DC with at least a 200mA current capacity. A small 12V DC field battery or your car's battery work well or you can even "rubber band" the charger to a 6- or 7-cell car pack and slip it into your pocket! Sirius also offers an AC wall adapter. To charge a battery, just plug it in. The charger determines the number of cells in the pack and, indicated by a glowing green LED, proceeds to charge the battery. When the battery is completely charged, the LED blinks, and the charger drops to a maintenance charge. This is not a trickle-charge, but a series of full-current charge and dis-

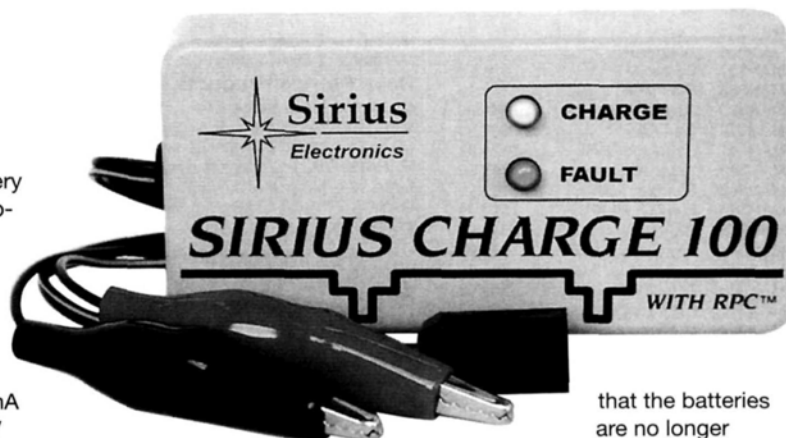
charge pulses that keeps the batteries optimally charged and eliminates any "memory" effects. If the battery voltage exceeds 13.75 volts or remains below 3.5 volts after 5 minutes of charging, a red LED lights to indicate a fault. Sirius chargers do not use conventional peak-detection circuitry; instead, they use a patented technology to pulse charge, predict the peak and terminate the charge. Initial tests indicate that the batteries accept as much charge as before, but the big difference is

that the batteries are no longer warm after charging.

Though you might like to charge batteries faster, smaller capacity cells don't like being pushed hard. The Sirius 100 carries a limited lifetime warranty, and at just \$49.95, it's a real bargain!

—Thayer Syme

Sirius Electronics, 12470 SW 1st St., Ste. 203, Beaverton, OR 97005; (503) 671-9455; fax (503) 671-0945; order line (800) 532-0092; [www.SiriusElectronics.com](http://www.SiriusElectronics.com)



# PRODUCT WATCH

SKS Videos

## Chino Air Museums and the Superman Jet Rally Pass the popcorn!

Anyone with a VCR and a love for models must already know about SKS Video Productions. SKS has been producing enjoyable modeling videotapes for many years. The two newest videos from SKS are "11th Annual Superman Jet Rally" and "Chino California Air Museums." At \$19.95 each (plus \$3 S&H), both are worth your viewing time.

The Superman Jet Rally, held in Metropolis, IL, has become a major event for the jet set. The 97-minute tape is very impressive and features turbine and ducted-fan-powered models in fine detail. There are several personal interviews with the modelers flying the jets. Included are world jet champion Wolfgang Kluhr's super-impressive, twin-turbine-powered MiG-29a and Scotty Bolduc's beautiful, turbine-powered Crow Aviation F9F Panther. If you can't make it to Superman's hometown, or if you like seeing super-duper jet models in flight, check out this video.

If you crave full-scale flavor, the Chino Air Museums video is a virtual feast for the eyes. The Chino Airport



collection of more than 100 rare and unusual aircraft fills three air museums. Most of the aircraft are in flyable condition and range from early aviation classics to WW II heavy-iron superstars and even early jet-age fighters. The video gives you a tour of the Planes of Fame museum, which houses many WW II U.S. Army Corps and Navy aircraft and the world's only completely authentic (and flyable) Japanese Zero! Rare and famous Reno air-racers are also shown.

The Fighter Jets Museum houses the likes of the F-104 Starfighter, the Me 262 Swallow and the U.S.'s first jet fighter, the Bell P-59 Airacomet. If you like jets, look no further.

The Yankee Air Museum features an aircraft rebuilders shop. A replica Jenny is shown in detail, as is a fully restored P-47 Thunderbolt. You get a feel for just how big the Jug is when you see it in the hangar.

The Chino Air Museums tape runs about an hour.  
—Gerry Yarrish

SKS Video Productions, RD #1, Box 264, Pine Rd, Abbottstown, PA 17301; (800) 988-6488; (717) 259-7193; [www.sksvideo.com](http://www.sksvideo.com)

## Hobbico Precision Modeling Tools Workshop necessities

For a model airplane to fly well, a straight, strong airframe is every bit as important as a good pair of thumbs at the controls. Hobbico sells a variety of products designed to help you in the shop and improve the quality of your construction.

The four-piece Builder's Metal Template enables you to set all of the critical components, such as ribs and formers, squarely in place. When it's time to cut stringers or join balsa sheets, the 1/16-inch metal templates provide a precise straightedge and true 30-, 60-, and 90-degree angles, plus a 45-degree triangle.

If you enjoy scratch-building, another modeling must-have is the Builder's Protractor. Not only is it helpful in the design stage, but you can use it to measure and transfer angles from plans straight onto wood for cutting.

The Quick Drill Set contains five hand drills (3/16-, 1/8-, 3/32-, 5/64- and 1/16-inch) that make quick work out of pilot holes, running servo leads, installing dowels, running pushrod

shrouds through bulkheads, etc.; the set is tucked away in a handy pouch. The drills' knurled grips help you make holes easily, even through hardwood. The drills are anodized in different colors for quick identification, and they also have their sizes stamped on. I've found the drills handy to use both in the shop and at the field.

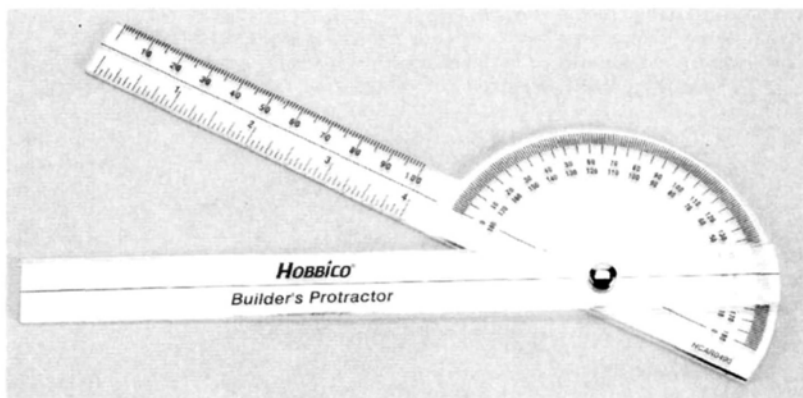
—Bob Hastings

**Metal Template Set**—part no. HCAR0500; \$7.99.

**Builder's Protractor**—HCAR0490; \$7.99.

**Quick Drill Set**—HCAR0699; \$11.99.

Hobbico, distributed by Great Planes Model Distributors, 2904 Research Rd., P.O. Box 9021, Champaign, IL 61826-9021; (800) 682-8948; fax (217) 398-0008; [www.greatplanes.com](http://www.greatplanes.com) ✦



# Astro Flight News

**Astro Flight Inc. Introduces five new and exciting products for the electric flyer: The new Mighty Micro 010 Brushless Motor for park flyers, a new Ducted Fan Brushless 05 Motor for the Kyosho T-33, FAI-035 and FAI-05 Planetary Motors for Sailplanes and two new surface mount digital speed controls.**

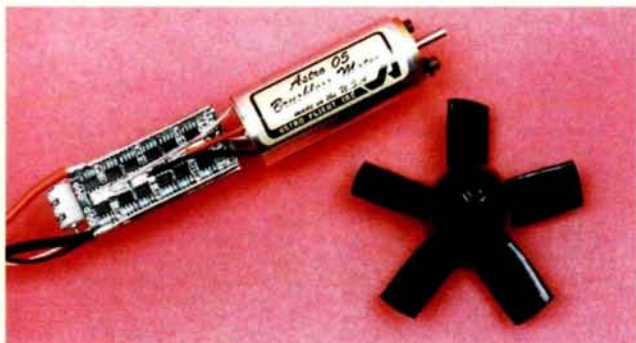
## **The Mighty Micro is here!**

Our new Mighty Micro Brushless 010 Motor #801 has arrived. The motor is one inch in diameter and one inch long and weighs only 35 grams with sensorless control. It spins an APC 6x2.8 prop at 9800 RPM while drawing only 2.5 amps from a six cell 350 mahr Nicad pack. Now you can fly for 5 minutes on Nicads, 10 minutes on Hydrides and one hour on lithium cells. The tiny On-Off Brushless control has Brakes and BEC. This system will work with 5 to 8 cell batteries. Perfect for models up to 10 oz.



## **New Ducted Fan 05 Motor!**

Our new 4 turn Brushless 05 Ducted Fan Motor #805F with 12 FET controller is specially designed to add Afterburner performance to the Kyosho T-33 and WE-Mo-Tek 480 ducted fan units. Run the T-33 fan on 8 or 9 Nicads or 10 Sanyo 3000 mahr Hydrides. The motor draws only 19 amps for 10 minute flights on Hydrides.



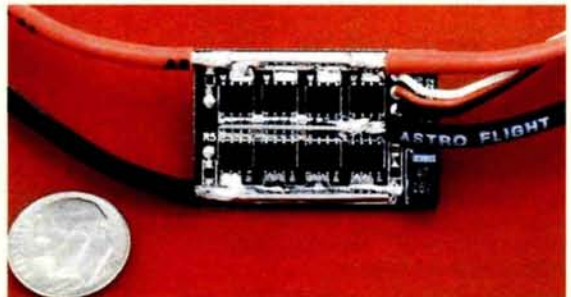
## **FAI-035 with Planetary Gearbox**

Our new 4.4:1 planetary gear box is now available for all Astro Cobalt 035, 05 and 15 motors. The FAI-035 with planetary gear box is perfect for 7 cell competition sailplanes. The FAI-05 with planetary gear box, shown here, is perfect for 10 cell sailplanes.



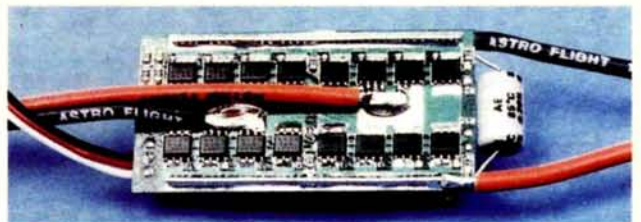
## **New Astro 215D Airplane Control**

The new Astro 215D Speed control uses new surface mount technology for minimum size and maximum performance. The tiny 215D weighs only 8 grams and has Brakes and BEC. It handles up to 30 amps and 10 cells. Perfect for Astro Cobalt 035, 05 and 15 motors.



## **New 208D Reversing Control**

The new 208D Reversing Control is designed for scale boats. It's 16 FET H-Bridge circuit gives you full power forward and reverse. The 208D weighs 1 oz and can handle 25 amps at 6 to 12 volts. It has a 2 amp BEC and a electronic current limit of 28 amps, so no fuses are needed. It was designed for tug boats and works great with 150 pound robots and electric powered blimps.



**Astro Flight Inc.** 13311 Beach Ave. Marina Del Rey, CA 90292

Phone (310) 821-6242 Fax (310) 822-6637 Web Site <http://www.astroflight.com>



## Vanquish the varnish!

**C**ontrary to what you may have heard, clean engines perform better than dirty engines! A clean engine is easier to adjust, runs cooler, and ultimately, will last longer. The dirt I'm talking about is not ordinary abrasive dirt; I'm referring to combustion-generated varnish. If it's ingested, abrasive dirt is public enemy number one; varnish runs a close second.

Ordinary dirt can be prevented from entering an engine by:

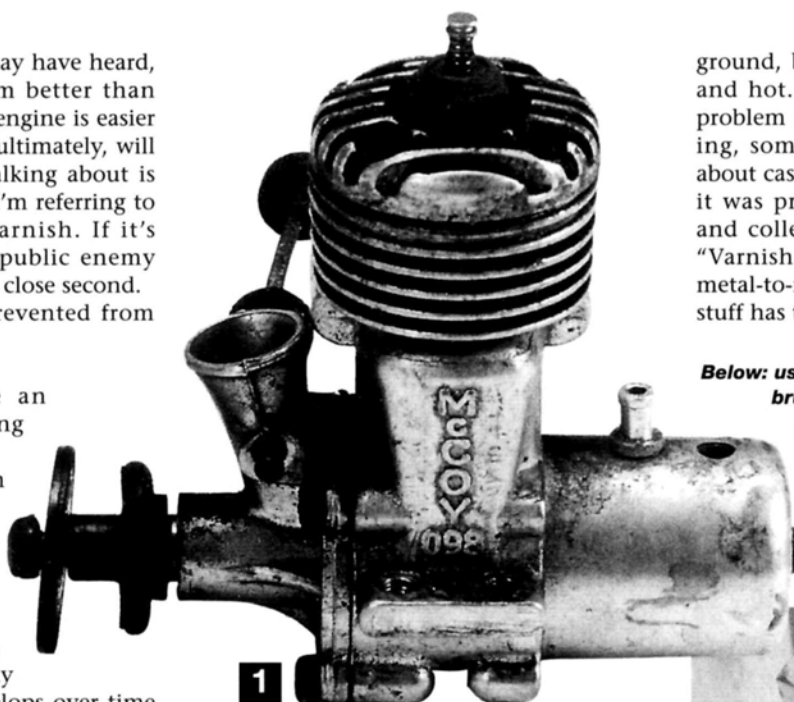
- using an air filter;
- minimizing the time an engine runs while sitting on the runway;
- rinsing away dirt after an unintended encounter with terra firma.

Varnish is a more insidious villain; it sneaks up on you. Although an affected engine seems to run well one day and poorly the next, the problem develops over time and will show effects sooner or later depending on the fuel blend you use and the amount of flying you do.

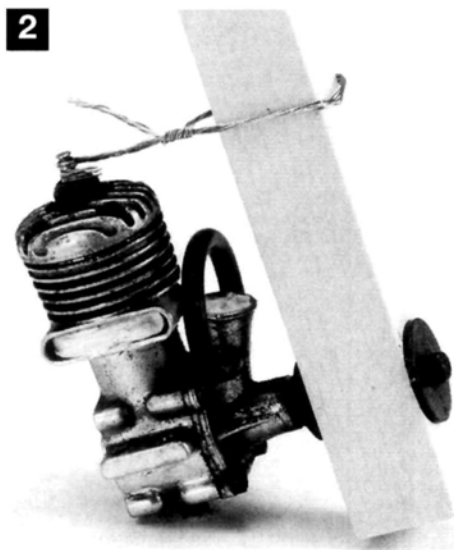
I remember the first time one of my engines needed to be de-varnished; the plane sounded good while running on the

ground, but "ran away" in the air—lean and hot. After I had struggled with the problem for the better part of the morning, someone at the field informed me about castor-oil-generated varnish. He said it was produced by lean, hot operation and collected on the piston and sleeve. "Varnish is good," he said. "It prevents metal-to-metal contact. Unfortunately, the stuff has to be removed occasionally."

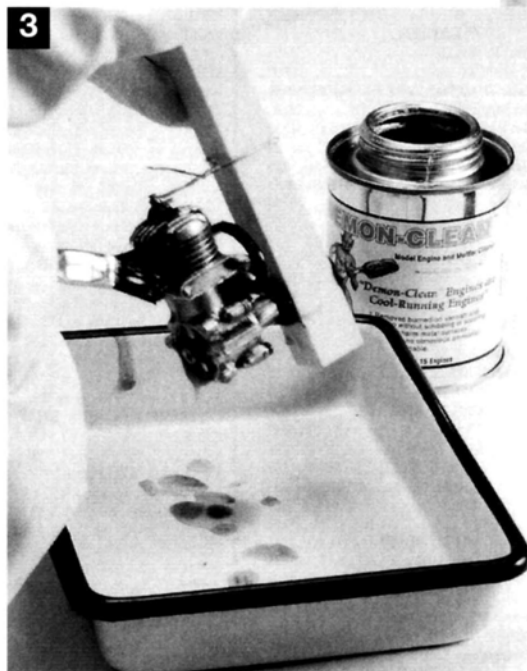
**Below: using rubber gloves and goggles, brush engine surfaces and components vigorously with an old toothbrush under warm tap water (in some cases, a heavy-duty nylon or wire brush is needed). Dry, lubricate and reassemble the engine.**



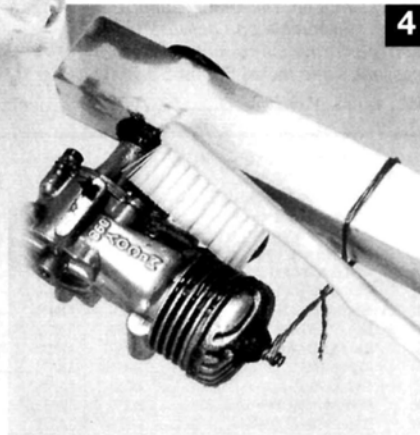
**1** Above: heavily varnished exterior of nostalgia-era engine.



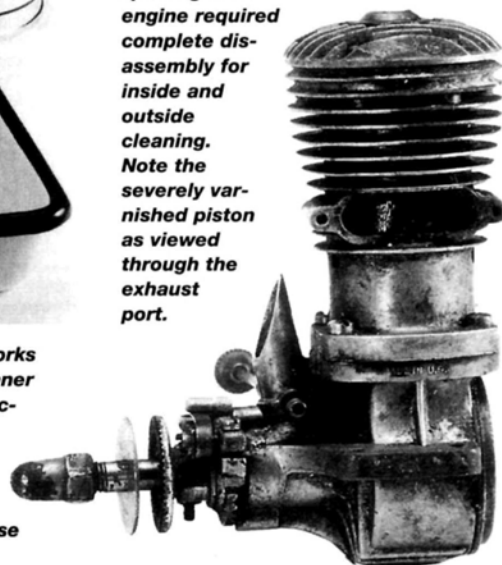
**2** For exterior engine cleaning only: remove accessories (in this instance, the needle valve and tank); pack a piece of paper towel into the exhaust port and another into the air intake. Seal the needle valve and spray-bar holes with a length of fuel line. Attach a simple holding stick to the engine crankshaft, then lock the assembly with wire wrapped around the glow-plug stem and stick. (This tip is from Higley's "All About Engines.")



**3** Hold the engine over a catch-pan (a pie tin works well), and apply a liberal coat of chemical cleaner with the application brush. Always wear protective rubber gloves and goggles. Give the cleaner 30 to 45 minutes to do its work. (Note: Demon-Clean\* chemical cleaner may be left on metal surfaces for days or weeks without its causing damage; however, never use it on painted or anodized surfaces.)



**5** Right: this heavily varnished, antique spark-ignition engine required complete disassembly for inside and outside cleaning. Note the severely varnished piston as viewed through the exhaust port.



**6** After the engine has been correctly disassembled, the major components are ready for cleaning with chemical cleaner.



Below: after cleaner has been applied, the catch-pan provides a place for the engine to sit while the chemical does its work. Difficult-to-clean areas may require a second application.



At first I thought this corn-cob-smoking adviser was just blowing smoke rings—pulling my leg. After all, I had been running engines since I was 11 years old and I had never had this problem before. Those were the days (early 1960s) when we used commercial fuels that contained 100 percent castor oil; Fox Superfuel and K&B 100 are two that come to mind. Anyway, after yet another lean flight, I decided to exorcise the varnish. I removed the engine from the airplane and hurried home; then I cleaned it according to my advisor's instructions. Back at the field, my skepticism ended when the little .35 performed beautifully. It goes without saying that since

that day, I have been a believer. Thanks, Pappy deBolt!

#### CASTOR OIL, VARNISH AND ENGINE PERFORMANCE

Castor oil in fuel is the best protection against high-temperature, over-lean operation in miniature 2- and 4-stroke engines. During a high-temperature episode, castor oil forms a tough, protective varnish on the piston and cylinder, and this usually prevents catastrophic damage from the heat. Unfortunately, varnish buildup ultimately, through overheating and

viscous piston drag, degrades engine performance.

When fuel spills, castor oil also varnishes the hot outside surfaces of the engine, especially the cylinder head, exhaust stack and muffler. Acting as a thermal insulator, varnish buildup (both inside and out) reduces the engine's ability to cool, thus promoting high-temperature, erratic operation. Revealing itself as an ugly, dark brown smear, varnish stubbornly resists removal with common solvents.

Forty years ago, we removed engine varnish mechanically, using a variety of techniques incorporating wire brushes, steel wool, sandpaper and abrasive soap. Although these products worked satisfactorily to remove buildup, there was always a chance of damaging precision engine components.

Today, we have chemicals that have

been specifically tailored to safely and effectively remove varnish without subjecting the engine to potential damage. Keep in mind that it's important for engines to be disassembled and reassembled using the correct tools and techniques. Two currently available reference books concerning

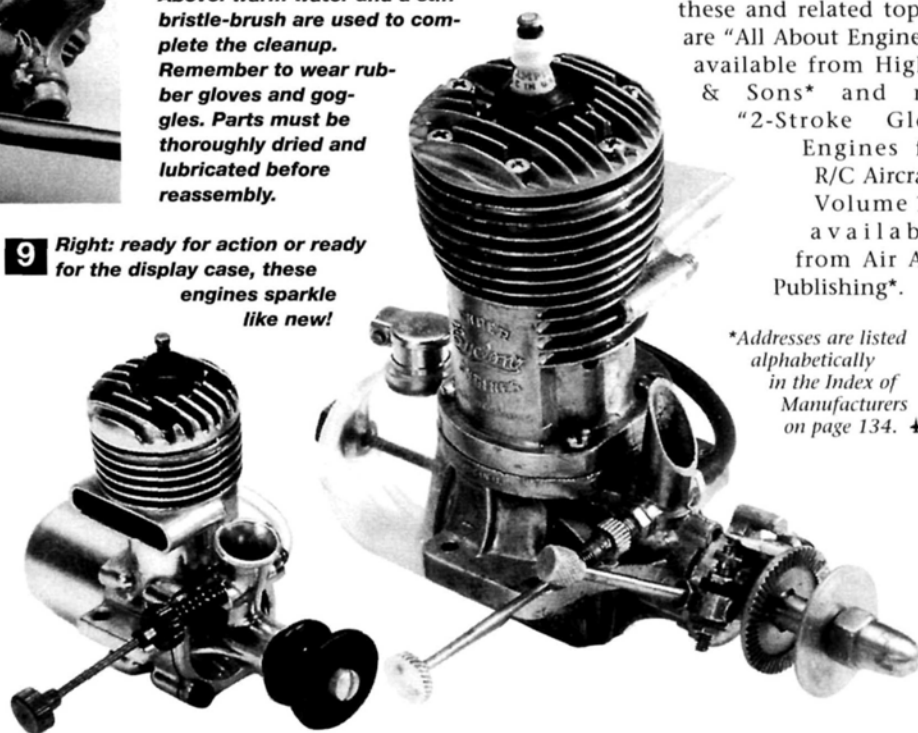
these and related topics are "All About Engines," available from Higley & Sons\* and my "2-Stroke Glow Engines for R/C Aircraft, Volume 1," available from Air Age Publishing\*.

\*Addresses are listed alphabetically in the Index of Manufacturers on page 134. ★



Above: warm water and a stiff bristle-brush are used to complete the cleanup. Remember to wear rubber gloves and goggles. Parts must be thoroughly dried and lubricated before reassembly.

**9** Right: ready for action or ready for the display case, these engines sparkle like new!





# GRASSROOTS by Charlie Viosca

Reports from readers around the world!

## London Bridge Seaplane Classic

If you like scale RC models and relaxing at the beach, you should attend the annual London Bridge Seaplane Classic hosted by the Desert Hawks R/C Club. This three-day fun-fly is held at the Nautical Inn in Lake Havasu City, AZ, in a protected cove with a beautiful sand beach. In its 14th year, the Classic was attended by 95 pilots and 140 planes, and several thousand spectators came to admire the models on the beach and in the air. There was very little wind—calm conditions always make water flying easier—and the beach is the perfect spot to fly from. Pilots from Arizona, California, Oregon, Idaho, Utah, New Mexico, Colorado and Texas recorded more than 1,000 flights.

**Send in your event coverage.** Mail photos, captions and text (500 words or less) to "Grassroots," *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA. Color slides and prints are acceptable.



*This Balsa USA Super Cub was built by Charlie Viosca. Notice the flaps down and the canoe strapped to the right float.*



*Above: Bruce Estes of Foster City, CA, kit-bashed this Supermarine S-6 model from a Great Planes® Super Sportster. With a SuperTigre 2300 for power and Stream® ABS floats, the model weighs 13 pounds. The wing is covered with Super Coverite®, and the rest of the model is covered with lightweight fiberglass and painted with PPG automotive paint.*

*Below: Chuck Watkins launches Charlie Viosca's Dynafite® Super Decathlon, which is powered by a Brison® 3.2 gas engine. The model is equipped with a smoke system and a parachute, and it's very aerobatic.*



After the Saturday night banquet, the pilots put on a spectacular night-flying show. One modeler with a Balsa USA\* Northstar lit up the sky with all kinds of steady and flashing lights; it's just too bad that this event can't be recorded on film.

Many accomplished fliers attended, and it was terrific to watch them wring out their models. I'm always amazed to see pilots fly their planes inverted just inches off the water. As usual, there were Cubs of all sizes and paint schemes and many low-wing aircraft, such as the Space Walker. Also in the air were Extra 300s, Lazy Bees and assorted RC converted free-flight models. Of course, no one brought a jet to the meet, but I bet we'll see one soon; the Convair Sea Dart would be a great scale jet model for it.

During the lunch break, the Kalt Helicopters division of Airtronics\* put on a

1-hour demonstration led by Rick Mattie and Brian Tucker. The flying really was spectacular; I can't believe how well these helicopters fly inverted.

Congratulations for a job well done goes to event chairman Gene Estes and the rest of his team: "beach master" George Fields, frequency-control chair Bill Clarey III, vendor chair Phil Hatch and site-preparation chair Ray Young. Most of the 130 members of the Desert Hawks also helped to make the 14th London Bridge Seaplane Classic a success. The event sponsors, Airtronics, K&B Model Products\*, Zurich Intl.\*, Lanier RC\* and Dremel\*, are most appreciated.

This year, the London Bridge Seaplane Classic will be held on November 10, 11 and 12. For more information, check out the Desert Hawks R/C Club website at [www.ctaz.com/kelcomp/hawks.htm](http://www.ctaz.com/kelcomp/hawks.htm).



**Top:** Frank Green of Gilbert, AZ, built this beautiful, 16-pound, 110-inch-span Sikorsky S-38. Two SuperTigre\* ringed .40s provided ample power, and Frank designed a magnetic ball-valve gravity fuel system so fuel does not flow when the engines are not running. A modified Airtronics radio has a slide switch that allows the use of differential engine power for taxi maneuvering. **Bottom:** the Pilots' Choice award went to Ted Torpin's C-47, which is powered by two O.S.\* .91 4-stroke engines. The model flew well and looked very realistic in flight, and the sound of its twin 4-stroke engines was awesome.



**This Beechcraft Staggerwing was built by Ken Thornton (Anaheim, CA), who flies it inverted only 2 feet off the water!**



\*Addresses are listed alphabetically in the Index of Manufacturers on page 134. ✦

*A classic returns!*

# Ace Digital Dual Vari-Charger

by Bob Aberle

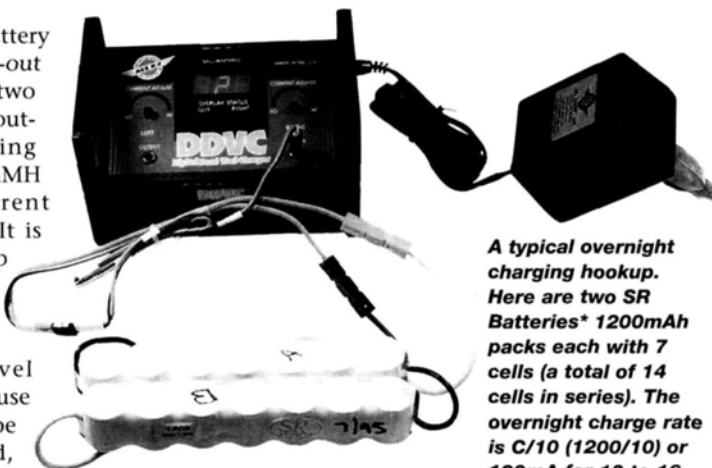
Several years ago, Ace Hobby Distributors\* (formerly, Ace R/C) stopped producing the Digital Dual Vari-Charger (DDVC). Always popular with electric-power enthusiasts, it was capable of charging battery packs overnight (C/10). Like other e-power modelers, I owned two of these chargers but still wanted a third. Well, by popular demand, Ace has reopened the DDVC production line, and those familiar, "blue boxed" units are available again.

This variable-current battery charger has a digital read-out milliammeter and provides two adjustable outputs. Each output is capable of charging from 1 to 10 Ni-Cd or NiMH battery cells at a current of up to 500 milliamps. It is even possible to charge up to 14 cells at up to 300 milliamps with good reliability.

This type of low-level charger is necessary because Ni-Cd batteries need to be periodically conditioned, and this is best done using an overnight charge rate determined by taking the capacity ("C") of the cell (in milliamp hours, or "mAh") and dividing it by 10; that is, a C/10 charge rate. So, a cell rated at 3000mAh would require an overnight charge current of 300mA. At that rate, the pack should remain on charge for a period of 10 to 16 hours—an overnight charge. Charging packs in this way tends to equalize the cells' characteristics, so it is easier to fast-charge them at higher rates.

For many years, I have charged all of my packs overnight the night before I go flying. My first flight of the day uses that overnight charge, so it isn't a "strong" flight, but it does warm up the battery for a long day at the flying field. After that first flight, I use a fast-charging, peak-detecting field charger and usually set it at a 3C rate (three times the battery's rated capacity). This takes around 20 minutes. Many e-power modelers feel that this C/10 charging is a must before using a fast charger, and because we use many battery packs, we need many variable-current, overnight chargers to prepare for a day of flying. That's why I own several Ace R/C DDVC units and still want more!

The DDVC's operation is simple. For power, a transformer (supplied with the



*A typical overnight charging hookup. Here are two SR Batteries\* 1200mAh packs each with 7 cells (a total of 14 cells in series). The overnight charge rate is C/10 (1200/10) or 120mA for 10 to 16 hours.*

charger) converts your 115V, AC household current to approximately 12 to 18 volts DC. Because overnight charging is almost always done at home, there is usually no need to run the DDVC off a 12V battery source, but it can be done. Ace provides two, 0.010-diameter pin plugs, which can be soldered to Deans\* three-pin (using only two of the pins) or Sermos\* connectors. From there, you can make adapters to match your packs. Ace also offers a series of prewired adapter cables.

Power up the DDVC, then attach a battery pack to one of the outputs. Select the proper meter scale and the desired current level (increments as low as 5 milliamps!). Note that if you want to change the current level going to the left side, you need to switch the meter function to the left side, and vice versa. If you do not, you will still change the current level, but you will be viewing the level from the other side. There is only one meter function, which is shared between the two outputs.

Besides its heavy-duty output, the DDVC can also be set to very low current levels, even down to just 5mA! This would be perfect for charging those tiny, 50mAh cells used in micro flyers.

When using the DDVC charger, you



*Note the two outputs, each with its own current adjustment knob. The display status switch lets you set the digital meter to one side or another.*

## SPECIFICATIONS

**Model:** Digital Dual Vari-Charger

**Manufacturer:** Ace Hobby Distributors

**Type:** dual output with separate level adjustments

**Maximum charge setting:** up to 500mA (1 to 10 cells); up to 300mA (1 to 14 cells)

**Minimum current setting:** 5mA

**Basic purpose:** overnight charging of Ni-Cd and NiMH batteries

**Current meter:** a single, digital-readout meter that is shared by the two outputs

**Input voltage:** 12V DC (transformer can convert from 115V AC to 12 to 18V DC)

**Size:** 7x4x4 in. (excluding transformer)

**Street price:** \$80

**Comments:** the DDVC is just the thing for any electric-power enthusiast who wants to charge more than one pack overnight. The DDVC will charge two packs at a time, and Ace units can be stacked to conserve space! This unit has everything you need to prepare for a day of fast-charging at the field.

### Hits

- Dual output.
- Can charge using a wide range of currents.
- Able to charge 50mAh Ni-Cd cells.
- Can handle packs up to 14 cells.
- Both AC and DC input.

### Misses

- None.

must keep in mind that it is not a peak-detect or automatic cut-off charger. You are the only one who can stop it. Don't forget about it, or you could damage your cells.

So, while the new supply lasts, here's your chance to add another Ace Hobby Distributors' DDVC to your hobby inventory. If you don't already have one, what are you waiting for? Thanks for thinking of us, Ace!

\*Addresses are listed alphabetically in the Index of Manufacturers on page 134. ★

# Nearly twice as many giant scale models are powered by Zenoah than any other gas engine brand.\*

## Smart people, those giant scalers.

\* Based on a one-year survey of High Flight event reports.



Front L. to R., the G23 and GT74. Center, the G62.  
Rear L. to R., the G38 and G45.

Zenoah engines are exclusively distributed by Horizon Hobby, Inc., 4105 Fieldstone Road, Champaign, IL, 61822 [www.horizonhobby.com](http://www.horizonhobby.com)  
For more information or your nearest Zenoah retailer, call toll-free, 877-504-0233.

If you're a giant scaler, chances are you've been around for a while.

You've seen fads come and go. You know what works, and you know what doesn't. You're savvy enough to spot a product that delivers great performance every time, and that's why you've made Zenoah engines number one.

What you may *not* be aware of, is what's behind their outstanding reliability.

Zenoah is a world-class, ISO 9001 award-winning builder of small engines. And except for carbs and plugs, of course, Zenoah produces its aircraft powerplants entirely on-site, from foundry to final assembly. So Zenoahs are the only giant scale engines to benefit from the kind of quality assurance standards and consistent tolerances that are hallmarks of a modern, state-of-the-art production facility.

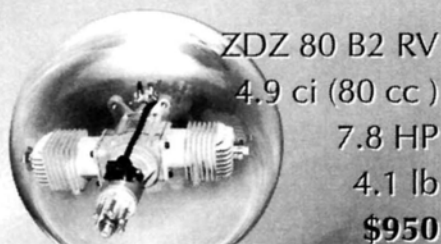
Bottom line? Zenoahs are one of the most reliable engines in giant scale. Not to mention a superb value, too.

But that, you knew. After all, it's hard to fool someone who's been around for a while. See the Zenoahs at your local dealer's now.

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A HORIZON HOBBY BRAND

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**ZDZ 40 RV-L**  
2.4 ci (40 cc)  
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2.9 lb  
**\$450**



**ZDZ 80 B2 RV**  
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*Your R/C hardware store for scale and aerobatic airplane supplies.*

*Shown is only a partial listing of the products offered. Order direct discounts are available on most items.*

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NELSON Hobby is the only accessory supplier specializing in double truss laser cut aluminum servo arms, bellcranks, and control horns. Over 50 sizes are made. Heavy duty 4-40 ball links are supplied with all units.

1" Airtronics/Futaba servo arm.....\$8.95  
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6" Ball bearing (pull-pull) bellcrank.....\$21.95  
3" Rudder Control Horn (32% Extra).....\$10.95

## LINKAGE FITTINGS

Different types of pushrod, bellcrank, servo output arm, and pull-pull attach fittings are offered.

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4-40 Alum. Rod end with ball bearing.....\$11.95  
3/16" HD ball links (10 pk).....\$4.95  
1/4" HD ball links (10 pk).....\$6.75  
Pull-Pull Cable attach fitting (4 pk).....\$3.95  
1/32" Stainless Steel Cable (24 ft.).....\$3.95

## SCALE STREAMLINE FLYING WIRES

Exact scale stainless steel streamline shape flying wires made to custom lengths. Made exactly the same, and look the same, as full scale flying wires. Miniature steel clevises with pins have right and left hand threads to allow easy adjustment. Five sizes from .094" to .185" wide. Lengths from 6" to 42". Prices range from \$32.95/pair to \$55.90/pair. Customer to supply lengths as needed.

## FLYING WIRE IN BULK LENGTHS

1/8" Wide x 1/32" thick stainless steel streamline shaped flying wire material is available in 6 and 24 foot lengths. Customer to install ends. Instructions show easy way to fabricate realistic 2-56 threaded ends by silver soldering a 2-56 cap screw to the wire. The wires are available for \$7.95 for 6 feet and \$19.95 for 24 feet.

## MINIATURE PIANO HINGES

Very realistic miniature piano hinges are available in 3/8", 1/2", and 5/8" widths. This is the width when laid flat. Made from .017" steel in 10, 20, and 30 inch lengths. These hinges are perfect for Piper Cub doors, wheel well doors, inspection hatches, split flaps and dive brakes.

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5/8" x 30" hinge.....\$9.75

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NELSON Hobby Paint is a **no smell** polyurethane fuel proof paint ideally suited for model painting. Water is used for thinning and clean up. Dries in 5-10 minutes. Apply with a foam rubber brush or spray equipment. Finish has a good gloss and can be enhanced with a gloss clear. A flat clear is available. Over 600 colors are made with our color mixing equipment. Can provide the FS military colors, and most of the foreign military colors. Film colors can be matched as well. A white epoxy primer is available and it also thins with water. Prices are reasonable and there is no expensive hazard shipping cost. And, no thinner to buy.

1/2 pint (red, yellow, and orange).....\$9.95  
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Pint (red, yellow, and orange).....\$19.95  
Pint (other colors).....\$17.95  
Epoxy primer (pint).....\$14.95

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Our polyester heat shrink fabric is available in a 63" width and four yard lengths for \$25.00. It has a weight of 1.4 ounces per square yard. Fabric is manufactured to full scale aircraft specifications. This means that it has a controlled amount of shrinkage unlike cheaper polyester fabrics. Attach with heat sensitive glues, modeling glue, dope, or CA glue.

## HVLP SPRAY SYSTEMS

Our High Volume Low Pressure spray equipment reduces cost of painting because of a major reduction in the over-spray of paint. There is less tendency for the paint to run on vertical surfaces. Because of low over-spray, many modelers can now spray in their workshop. Turbine air source is only 9" x 9" x 9" and uses standard 110 volts. Any type of sprayable paint can be used. Special nozzles are available for specialty paints. Nozzle supplied can be used with enamel, epoxy, and polyurethanes. Unit is of professional quality.

Complete HVLP system.....\$699.95

## OTHER PRODUCT LINES NOT SHOWN

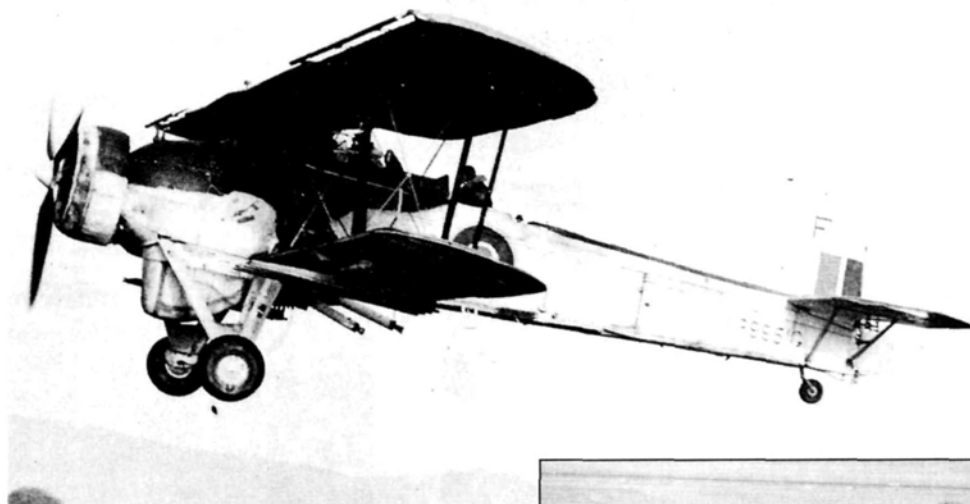
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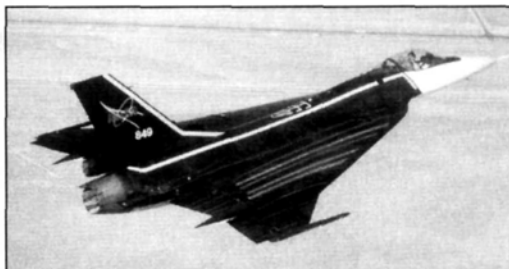
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# NAME THAT PLANE

Can you identify this aircraft?



The winner will be chosen four weeks following publication from correct answers received (delivered by U.S. mail) and will receive a free, one-year subscription to *Model Airplane News*. If already a subscriber, the winner will receive a free, one-year extension of his subscription.

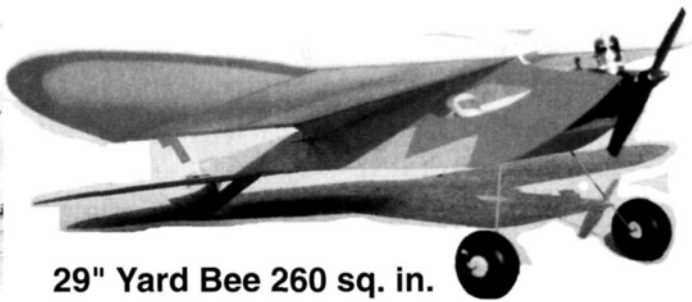


Send your answer to *Model Airplane News*, Name that Plane Contest (state issue in which plane appeared), 100 East Ridge, Ridgefield, CT 06877-4606 USA.

Congratulations to L.W. Butler of Bowie, TX, who correctly identified our March 2000 mystery plane as the F-16XL. NASA's XL project began with the ambitious objective of creating an all-weather Fighting Falcon with a 50-percent larger payload capacity and a shorter takeoff in only 19 months. The resulting "Cranked Arrow" delta-wing rolled out ahead of schedule on July 2, 1982. The jet is 56 inches longer than the regular Fighting Falcon, and it boasts an unassisted 2,500-mile range. Technological data collected from the two XL program jets have been used to improve aircraft design through laminar airflow research at sustained supersonic speeds and in sonic boom research with the famed SR-71 Blackbird. If you'd like to see more pictures of the F-16XL, they're available on the Web at: [www.dfrc.nasa.gov/gallery/photo/F-16XL1/HTML/index.html](http://www.dfrc.nasa.gov/gallery/photo/F-16XL1/HTML/index.html).



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29" Yard Bee 260 sq. in.

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Prices include U.S. shipping

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40" Speedy Bee.....	\$84
60" Big Lazy Bee (short wing).....	\$109
72" Big Lazy Bee (long wing).....	\$119
Float Kit for Lazy Bee, Speedy Bee, & L.B. Special.....	\$29
Float Kit for Big Bees.....	\$45

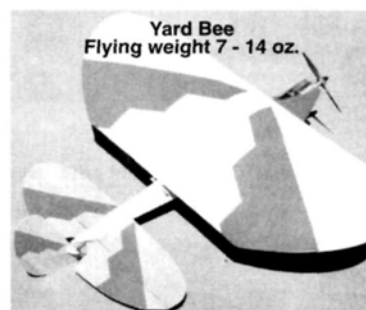
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Wheel size	Inflated dia.	Weight	Carry	Capacity per pr	Cost per pr
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#2	1 1/2" - 1 5/8"	.15 oz.		6 oz.	\$6
#3	1 3/4" - 1 7/8"	.30 oz.		8 oz.	\$6
#4	2" - 2 1/4"	.35 oz.		8 oz.	\$6
#5	2 1/4" - 2 5/8"	.35 oz.		0 oz.	\$7
#6	2 1/2" - 2 5/8"	.35 oz.		10 oz.	\$7
#8G	2 3/4"	1.0 oz.		6 - 9 lbs	\$10
#9G	3"	1.5 oz.		8 - 10 lbs	\$12
#10G	3 1/2"	2.0 oz.		0 - 12 lbs	\$14
#11G	4 1/2"	3.0 oz.		12 - 15 lbs	\$16
#12G	6"	6.0 oz.		TBD	\$30

Please don't let the zany hot-doggin' you have seen our Bees performing fool you into thinking that it's just a hot rod. Most guys simply can't resist flying them that way because the Bee lets them get away with things no other plane would survive. So please forgive them if they fly a little too low, or too close, or show off a little. The excitement of flying a Bee brings out the Walter Mitty in every pilot.

Beginners build confidence by flying a Bee because it survives the many hard landings and mistakes that a novice flyer makes. The novice can get lots more flight time because he's still got a plane! Unlike a trainer, a Bee never becomes boring. You can transform a Bee from mild to wild simply by changing the throw of its oversized control surfaces. Bees hold the interest and attention of pilots of any skill.

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Flying weight 7 - 14 oz.



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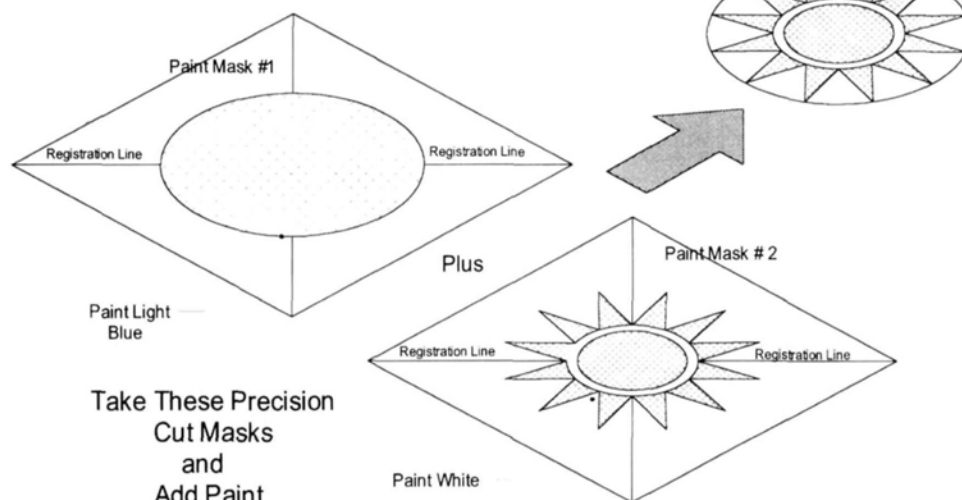
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**Aeroloft**, 7919 E. Mawson Rd., Mesa, AZ 85207; (480) 380-4799; fax (480) 380-4843; www.aeroloft.com

**Air Age Publishing**, 100 E. Ridge, Ridgefield, CT 06877-46-6 USA; (203) 431-9000; fax (203) 431-3000; www.airage.com

**Airtronics**, 1185 Stanford Ct., Anaheim, CA 92805; (714) 978-1895; fax (714) 978-1540; www.airtronics.net

**APC Props**; distributed by Landing Products, 122 Harter Ave., Woodland, CA 95776; (530) 661-0399.

**Balsa USA**, P.O. Box 164, Marinette, WI 54143; (906) 863-6421; fax (906) 863-5878; http://www.balsausa.com

**Bob Parkinson Flying Models**, 11 Byrne Dr., Ste. 506, Barrie, Ontario, Canada L4N 8V8; (705) 727-1340.

**Bob Violett Models (BVM)**, 170 State Rd. 419; Winter Springs, FL 32708; (407) 327-6333; fax (407) 327-5020; bvmjets.com

**Boca Bearing Co.**, 7040 W. Palmetto Park Rd., Ste. 2304 A1, Boca Raton, FL 33433; (561) 998-0004; fax (561) 998-0119; fax (800) 409-9191 (U.S. and Canada); bocabearings.com

**Brisson Aircraft**, 12075 Denton Dr., Ste. 11, Dallas, TX 75234; (972) 241-9152; fax (972) 241-5065.

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**Byron Originals**, P.O. Box 279, Ida Grove, IA 51445; (712) 364-3165; fax (712) 364-3901.

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**Great Planes Model Distributors**, 2904 Research Rd., P.O. Box 9021, Champaign, IL 61826-9021; (800) 682-8948; fax (217) 398-0008; www.greatplanes.com

**Higley & Sons**, P.O. Box 532, Glenwood, IL 60425.

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**Landier RC**, P.O. Box 458, Oakwood, GA 30566; (770) 532-6401; fax (770) 532-2163.

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**Meister Scale**, 6319 N.C. 49, Mebane, NC 27302; (910) 562-3700.

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**Rossi**; distributed by Sig Mfg. Co.

**SAC Headquarters Inc.**, 241 Mante Dr., Kissimmee, FL 34743; (407) 348-0663; fax (407) 348-9388.

**Sailplanes Unlimited**, 63 E. 82nd St., New York, NY 10028; (212) 879-1634; www.sailplanes.com

**Sermos R/C Snap Connectors Inc.**, Cedar Corners Station, Box 16787, Stamford, CT 06905; phone/fax (203) 322-6294.

**Sig Mfg. Co. Inc.**, P.O. Box 520, Montezuma, IA 50171; (800) 247-5008; (515) 623-5154; fax (515) 623-3922; www.sigmf.com

**Spirit of Yesteryear**, 40 Holgate St., Barrie, Ontario, Canada L4N 2T7; (705) 737-0534; fax (705) 737-0532.

**SR Batteries Inc.**, Box 287, Bellport, NY 11713; (516) 286-0079; fax (516) 286-0901.

**Stream R/C**, P.O. Box 113, Newport News, VA 23601-0113; phone/fax (757) 591-0720.

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# Build a Car-top Carrier

by Gordon Bradt

**D**o you have to leave the kids at home to make room in the car for your favorite flyer? Or is "hangar rash" reaching epidemic proportions? If you answered "yes" to either of these questions, this car-top carrier could be just the thing for you.

It's inexpensive (less than \$25) and can be built in a few evenings. It's lightweight (under 20 pounds) and weather resistant. You can store it outside or hang it inside. The secret? A combination of the old Quonset hut design and modern "stitch and glue" kayak-building technology.

The materials list is short: two 4x8-foot sheets of  $\frac{1}{8}$ -inch Philippine mahogany plywood; 25 feet of 22-gauge copper wire; 25 feet of fiberglass tape for the seams; resin or glue; and varnish.

## STARTING OUT

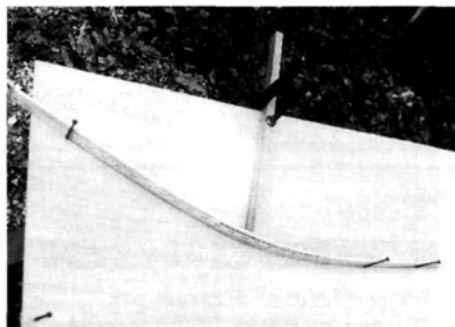
First, pick the best-looking sheet for the top. Decide how long to make your carrier but resist the temptation to use all 8 feet. I did that on my prototype and found that it was difficult to maneuver, store and mount. I decided on an 86-inch length for this model. The finished carrier weighs only 16½ pounds and, with its 80-inch wing and 70-inch fuselage, readily accepts my Sig\* Senior.

Use the sheet's finished edge for the back, and measure forward from it. You don't want to draw radii to plot the curves because plywood will bend more like a parabola (the ends have a very gradual curve, and the center has a sharp curve). A cheap wooden yardstick will form the proper curve for you automatically!

Drive in screws at the endpoints of the curves on one side of the front only. Notice that I have two screws about 6 inches apart where the two curves blend together. You must cut all the way to that back screw to relieve stress on the plywood as the bends change direction. You don't have to drive screws into the other

half; simply use some scrap cut out to match the first half. Using this template, the process is easier and you'll be assured of a perfect match.

Now lay the yardstick between the screws and bow the center enough so that



*A wooden yardstick will give you the correct curves for your pieces.*

the curve forms gradually. Clamp the center point and draw a pencil line on the outside of the curve (where the screws are). You will need to clamp the edges where you can't drive a screw. When you have drawn the four curves (the fourth being the front edge), cut the piece out with a jigsaw.

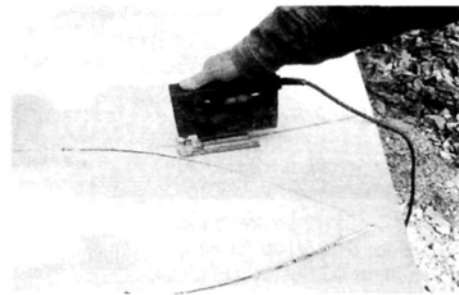
Now take the scrap, flip it over and line it up with the edges of the other side. Using the scrap as a stencil, trace the curves, then cut them out. Remember to extend the cut about 6 inches beyond where the two curves meet to provide the transitional stress relief.

Mark holes for wire ties starting  $\frac{1}{2}$  inch from the back edge,  $\frac{1}{2}$  inch in from the side edge and evenly spaced every 4 inches. Then, drill  $\frac{5}{32}$ -inch holes in each of these marks, except on the back.

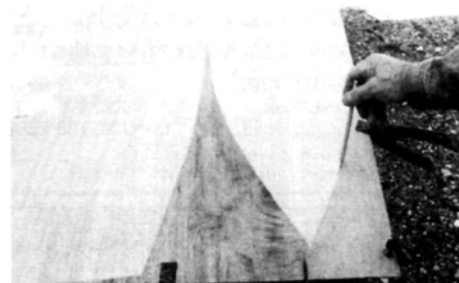
The bottom of my carrier is 33 inches wide and 16 inches high. If your plane has a taller tail with less width, you might make a narrower base. Try bowing a 48-inch wire around your plane's tail feathers to gauge the best proportion.

The curves of the bottom piece do not need to be cut now because they will be created by tracing along the top piece after stitching. For now, make the bottom 33 inches wide.

Now put the handles on the top. These come in very handy during the construction and facilitate mounting the carrier on your vehicle. Drill two pairs of



*To simplify your work, cut out the pieces with a jigsaw.*

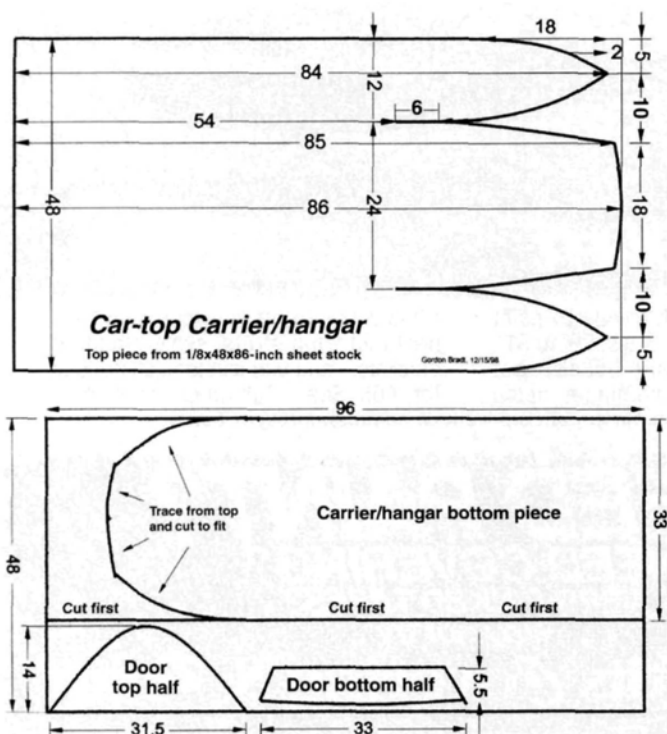


*Mark holes for your wire ties which, along with the fiberglassing, will hold the carrier together.*

holes (sized to match your handle material) at the centerline (CL) of the top, about a third of the way in on each side. Knot the ends on the inside, and seal it when you glass the seams.

## STITCHING THE NOSE

For the stitching, I recommend fine, 22-gauge copper wire. I glassed only the outside, right over the stitching. This works well if the wire is fine enough and the



Placing the twists on the outside allows you to pull the pieces together for a neater fit. Pull the whole nose assembly together, going back and forth and tightening to keep the edges evenly butted for the best appearance.

### BOWING THE TOP PIECE

To bow the top, first make two clamp bars out of 1x2x36-inch scrap. In each bar, make two notches 33 inches apart; these notches will hold the plywood in a curve. Pull the edges of the top piece together and slip a bar onto the middle. Place the other bar at the back as shown in the photo.

Now secure the bowed shape by wiring temporary cross wires about every 12 inches and holding the 33-inch width at each wire position. Then you can remove the clamp bars.

Now, lay the bottom piece across two sawhorses with the best-looking side facing down. Flip the top over and match the top and bottom. Stitch at one back corner and then the other. Leave the cross wires on until you have stitched the top and bottom together. Now stitch back and forth on the straight edges until you reach the point where the nose curves in. Remember to keep the edges even as you tighten the stitches.

### PULLING THE NOSE TOGETHER

Mark a CL on the top and bottom of the nose. Temporarily close the nose at the front with the CLs together and trace the top onto the bottom piece. Also mark the bottom hole locations so they will match. Reopen the nose and cut along this mark. Drill the marked holes. Temporarily stitch the front edges back together.

Using the top edges as your guide, trace along the bottom for cutting the mating edge. Do the same on the other side, making sure both sides match. Remove the front edge stitching and make the final cuts on the curved sides. Then, make the final stitching on the front edge. Drill the mating holes in the bottom and finish stitching there as well.

### FINISHING UP

Because paint will bring out irregularities, varnish is a better choice. Varnish the carrier now, because the glassed seams will appear much darker than the rest of the

wood if you don't. When fiberglassing the carrier, remember that because of the sharp corners, you should use very lightweight glass and prespray the back side with adhesive to hold the glass in place while you apply the resin.

The rear door and doorstops will provide structural support to the back of the carrier. The door is made up of two pieces. First cut four,  $\frac{5}{8}$ x15-inch and six,  $\frac{5}{8}$ x3-inch doorstops. Glue two of the 15-inch strips on the bottom, inset  $\frac{3}{4}$  inch from the edge and up against the outer edges. Then glue the 3-inch pieces on the top, and inset  $\frac{3}{4}$  inch at the 9-, 10-, 11-, 1-, 2- and 3-o'clock positions. Now glue the final two 15-inch strips flush with the edge, again, up against the outer edges. Be sure this leaves at least an  $\frac{1}{8}$ -inch groove along the bottom in which the door will rest.

The bottom door piece should be cut oversize, then fitted. Cut the bottom edge  $\frac{3}{4}$  inch lower in the center to match the sagging of the bottom piece. Hold this piece in place, trace the edges and cut the bottom half to fit.

When making the top door piece, temporarily put two inverted-V struts inside to hold and center the top of the carrier. Trace and cut the top door half, then trim it to fit as well. Place the bottom half in the  $\frac{1}{8}$ -inch



**The finished product, without the rear door in place. Notice the doorstops on the bottom and around the top; these hold the door in place.**

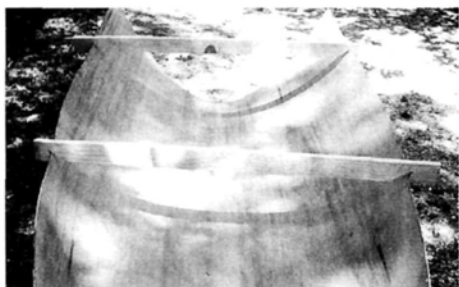
groove, hold the top half in position, then scribe along the bottom edge of the top half. Glue the halves together along the scribed line and mount a small handle at the top of the door. For a latch, I drilled two holes down through the top into which I dropped a U-shaped rod.

Now, simply toss your lightweight carrier onto your vehicle's top, position it so that it clears the open tailgate or trunk, and mark the spots for two tie downs on each side. Drill these holes at least 1½ inches from each edge, going through the side and bottom. I used 30-inch lengths of  $\frac{1}{4}$ -inch rope and sealed the holes with caulk.

Now you are ready to roll!

*\*Addresses are listed alphabetically in the Index of Manufacturers on page 134. ★*

twists can be flattened out to blend under the seams. Stitch one pair of holes at a time, and tie each stitch with a twist.



**A clamp bar can be made quickly by cutting notches into pieces of scrap wood.**



**Match the nose, trace a line, then cut along your mark with a jigsaw.**



**Again, trace a line and cut with a jigsaw—this time, for the sides.**

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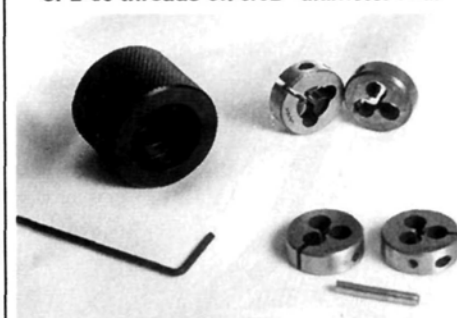
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## Stingray: the latest in flight control R&D

**T**he Stingray was built by Boeing to support flight tests for advanced control-system techniques at Georgia Tech Research Institute (GTRI) funded by the U.S. Government Defense Advanced Research Programs Agency. The program's official name is "AVIA," for "adaptive virtual aerosurfaces" for UAV (unmanned aerial vehicle) applications, but everyone calls it "Stingray"; I wonder why!

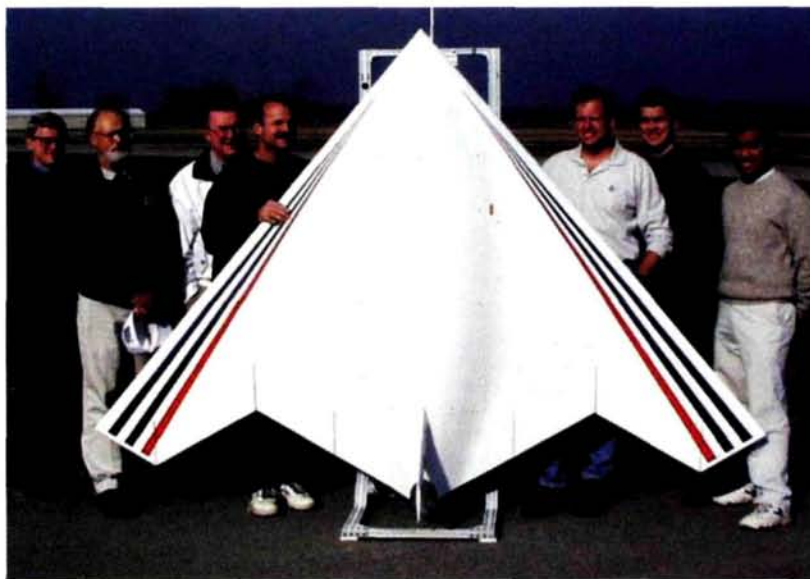
This is not a small aircraft: its wingspan is 2.79 meters (110 inches) and it's 1.83 meters (72 inches) long. An AMT Olympus turbojet engine provides ample motive force for this 43-kilogram (97-pound) package by providing 187 newtons (42 pounds of thrust).

Guidance is provided by an interesting mixture of off-the-shelf and custom gear. A Futaba 9Z transmitter talks to two independent receivers, each powered by its own 2000mAh battery through Jaccio regulators. Each receiver is designed to "drive" portions of both the left and the right sides of the plane, so reduced-authority control may be maintained even if one receiver is lost.

Its control scheme is not simple. Both inboard and outboard elevons are set up to work in the usual tailless-model way, but there's a complication: each elevon has a top surface and a bottom surface that can be commanded to move together or separately. The outboard elevons are split for yaw control (just like the B-2 bomber's) while the inboards are split for airbrake function during approaches and landings. There aren't enough programmable mixers in the 9Z for all of this, so a mechanical mixer is provided for each elevon, and yaw is handled by special mixer yaw electronics from Wray Associates, which also provided channel splitters and gear-door sequencing units for the retract system.

A bunch of servos (21, in fact!) is needed to manage all these functions, and I haven't yet mentioned retractable gear (from Robart), wheel-braking systems (from Glennis Aircraft), a rudder, and turbojet engine control. JR 4721 servos were selected for their speed and torque.

The Stingray, which is made out of fiberglass and foam, was

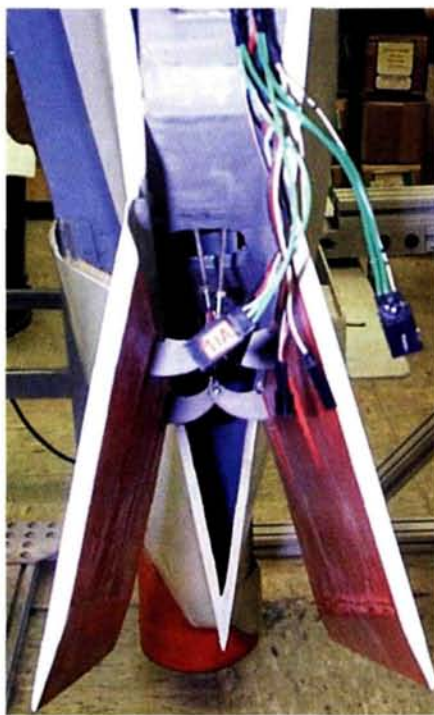


designed and built in only six months. The builders used molds made by a boat mold-maker in Washington state and made the wing skins with a slurry of epoxy and microballoons that filled the foam and adhered to the skins. For minimum drag and ease of setup, the Stingray's control surfaces use "living" hinges (one skin is cut to allow control movement, and the other skin flexes and so acts as a hinge [see photo lower right]).

Flight testing has shown the Stingray to

be very stable in cruise and quite fast: at ½ throttle with wheels down, it was clocked at 145kph (90mph). Landings were difficult because the Stingray wanted to continue flying! More effective airbrakes will help to "dirty" up the airframe to achieve satisfactory landings.

To record what happens while the Stingray flies, GTRI provided a custom, onboard data-and-downlink system to measure and transmit information on speed, acceleration, turning rates and angles and control deflections. A video



downlink from Plane Talk shows the view from the air.

This is the first phase of the AVIA test program. Another Stingray will eventually be built to allow the investigation of how the controls may be made to work more efficiently and to improve its "stealth" characteristics.

I'll keep you posted on the progress of this fascinating flying model! For more photos and video clips of Stingray's test flight, go to [www.modelairplanenews.com/video/stingray](http://www.modelairplanenews.com/video/stingray). ✈